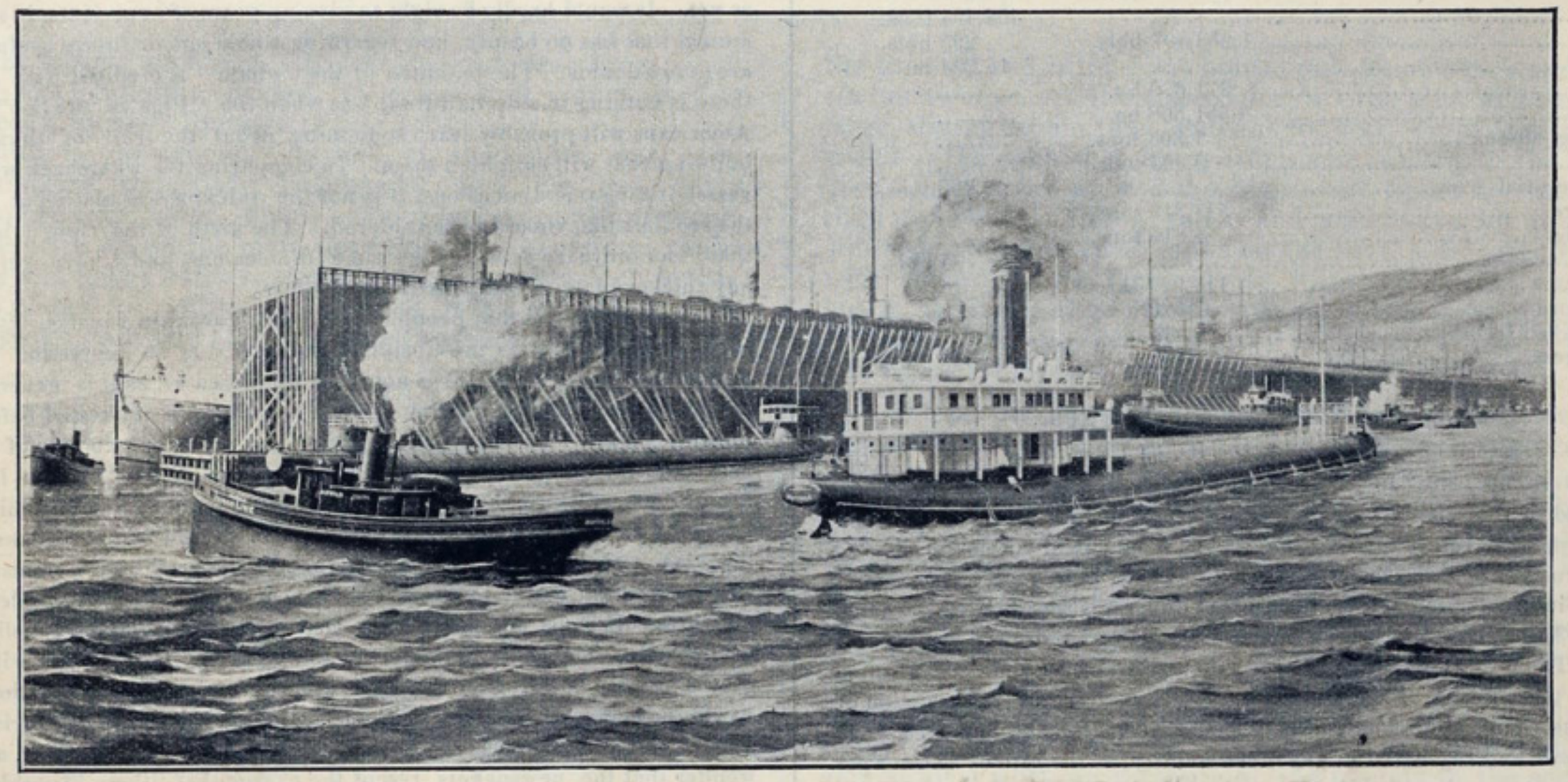
# MARINE REVIEW.

VOL. VIII. CLEVELAND, O., AND CHICAGO, ILL., NOV. 16, 1893. No. 20.

## Duluth's Big Ore Docks.

With the closing weeks of the present season of navigation, Duluth has figured quite prominently as an ore shipping port. As a part of the development of the Missabe range, there has been erected at that port an ore shipping dock that has already taken a place among the most important docks on the lakes, and vessels have been accorded dispatch equal to the best records of the older docks. A view of the new structure, which is owned by the Duluth, Missabe & Northern Railway, is presented on this page. The dock is 2,400 feet long, with an approach about 600 feet long. The height is 52½ feet above mean water level, and width 50 feet, four tracks being laid side by side. There are 500 ore pockets, with a capacity of about 150 tons each, the p esent capacity of the dock being about 75,000 tons. It is expected that this will reach 100,000 tons when the work is completed. The channel has been dredged out on either side of the dock and the intention is to have a depth of 20 feet. The channel will be extended 90 feet back of the present shore line, it is contemplated, the lay of the land being such that this can be done advantageously.



DULUTH, MISSABE & NORTHERN ORE DOCKS AT WEST DULUTH.

## Engines and Boilers for the Davidson Boats.

Capt. Jas. Davidson of West Bay City, Mich., evidently has confidence in lake tonnage as an investment, and although other yards are nearly all idle, he goes right along laying keel after keel. He has now under construction three large steamers, one of them a duplicate of the Cranage, which is at present the largest wooden hull afloat. On Friday last he closed a contract with the Frontier Iron Works of Detroit for boilers and machinery for all the boats. This is a tolerably heavy deal for these hard times and will doubtless prove a very acceptable winter job, especially when none of the shops are overcrowded with work. The larger steamer will be provided with triple expansion engines, with cylinders 20, 32 and 54 inches diameter and 42 inches stroke, and two boilers 13 by 13 feet. The other two boats will each have triple expansion engines 16, 25 and 42 inches diametes and 34 inches stroke, and one boiler 12 feet 3 inches diameter by 11½ feet long, fitted for forced draft. New patterns will be made throughout and something neat and original may be looked for.

## How a Well-Regulated Log Book is Kept.

How many landsmen know how a well-regulated log book is written up? It seems just as complicated as double-entry bookkeeping when one does not know, but after a little careful attention and study it's as easy to keep a log book as to eat hot gingerbread. There is a list of letters arranged and they look like so much Greek to the uneducated. The letter *b* stands for blue sky, whether there be clear or hazy atmosphere, *c* indicates cloudy or detached opening clouds, *d* denotes drizzling rain, a small *f* fog, a capital F thick fog, *g* gloomy, dark weather, *h* hail, *l* lightning, *m* misty or hazy, so as to interfere with the view. The letter *o* represents overcast, or when the whole sky is covered with one impenetrable cloud. Passing showers are noted by the letter *p*, and *q* indicates the weather to be squally. Continuous rain is indicated by an *r*, snow by an *s*, and thunder by a *t*. An ugly threatening appearance in the weather calls for the letter *u*, and visibility of distant objects, whether the sky be cloudy or not, is represented by the letter *v*. A small *w* is wet weather. A full point or dot under any letter denotes an extraordinary degree. As an example as how the letters are used take *q p d l t*. This reads very hard squalls and showers of drizzle, accompanied by lightning with very heavy thunder. Numerals denote the force of the wind. A cipher indicates calm, 1 light air, 2 light breeze, 3 gentle breeze, 4 moderate breeze, 5 fresh breeze, 6 strong breeze, 7 moderate gale, 8 fresh gale, 9 strong gale, 10 whole gale, 11 storm and 12 hurricane.—Goldthwaite's Magazine.

The shell plating of the Lucania, is from three-quarters to one inch in thickness, the plates mostly being 25 feet long by 6 feet wide. They are arranged on the raised and sunken strake principle, while the butts from the keel strake up are riveted on the overlap system.

## Increased Shipments of Everything Excepting Ore.

A steady gain in the movement of everything excepting iron ore from Lake Superior has resulted in an increase in the figures covering the St. Mary's Falls canal traffic, so that the movement of freight of all kinds through the canal up to the first of the present month was only 5.8 per cent less than on the same date last year. Coal shipments (hard and soft combined) show a fractional increase, while the flour movement is 1,399,249 barrels in excess of last year and the wheat movement 2,511,687 bushels ahead of last year. Among other increases are 61,960,000 feet of lumber and 708,882 bushels of corn. Following is a summary of the canal statistics:

ST. MARY'S FALLS CANAL TRAFFIC.

| | To Nov. 1, 1893. | To Nov. 1, 1892. | Per cent. of increase or decrease in 1893. |
|---|---|---|---|
| Freight of all kinds, net tons. | 9,657,763 | 10,256,704 | 5.8 decrease. |
| Coal, hard and soft, net tons. | 2,704,636 | 2,687,939 | .6 increase. |
| Iron ore, net tons | 3,729,506 | 4,621,860 | 19.3 decrease. |
| Flour, barrels | 9,591,787 | 4,592,538 | 30.4 increase. |
| Corn, bushels | 2,260,964 | 1,551,982 | 45.6 increase. |
| Wheat, bushels | 37,086,789 | 34,575,102 | 7.2 increase. |
| Lumber, M. feet | 521,681 | 459,721 | 13.4 increase. |

During October of this year the aggregate movement of freight of all kinds was 1,560,292 net tons, devided as follows:

| | East-bound. | West-bound. |
|---|---|---|
| Coal | ..... | 408,494 tons. |
| Flour | 1,253,407 bbls. | 295 bbls. |
| Grain | ..... ..... | 18,294 bu. |
| Corn | 371,370 bu. | ..... |
| Wheat | 6,551,308 bu. | ..... |
| Building stone | 1,303 tons. | ..... |
| Copper | 9,463 tons. | ..... |
| Manufactured iron | ..... | 6,095 tons. |
| Iron, ore | 541,319 tons. | ..... |
| Iron, pig | 4,816 tons. | ..... |
| Salt | ..... | 65,795 bbls. |
| Lumber | 111,969 M feet. | ..... |
| Silver, ore | 520 tons. | ..... |
| Unclassified freight | 21,533 tons. | 39,631 tons. |
| Passengers | 568 | 442 |

## Duty on Material for Barges.

Special Correspondence to the MARINE REVIEW.

KINGSTON, Ont., Nov. 16.—The dominion parliament, at its next session, is to be asked to thoroughly look into the question of the power of the controller of customs to refuse to allow the drawback now paid on material used in the construction of ships or vessels built in Canada to be paid on account of barges built in the dominion. It appears that under an order-in-council, dated Nov. 15, 1883, the government took power to grant certain drawbacks on ships' materials. The order-in-council provided that "a drawback may be granted and paid by the minister of customs on materials used in the construction of ships or vessels built and registered in Canada, and built and exported from Canada for sale and registered in any other country, at the rate of 85 cents per registered ton on iron-kneed ships or vessels classed for nine years; at the rate of 75 cents per registered ton on iron-kneed ships or vessels classed for seven years, and at the rate of 65 cents per registered ton on all ships or vessels not iron-kneed."

The merchants' shipping act and the Canadian registration act defines the term "ship" as "including every description of vessel used in navigation not propelled by oars." The customs act says "the expression 'vessel' means any ship, vessel or boat of any account whatsoever, whether propelled by steam or otherwise, and whether used as a seagoing vessel or on inland waters, unless the context is manifestly such as to distinguish one kind or class of vessels from another, and the word 'vessel' includes vehicle."

Mr. Waters, assistant commissioner of customs, has ruled that a barge does not come under the classification of "ship" or "vessel." By departmental regulation, but not by an order-in-council, he has taken it upon himself to give effect to this opinion in a circular addressed to collectors of customs, in which, in defining what class of vessels shall be entit'ed to a drawback, he says: "Drawbacks shall be paid only on vessels which have within themselves the power of independent navigation, either by means of sail, steam or other motive power."

It is in view of this action that the parliament is to be asked to consider the matter. Rev. Principal Grant of Queen's University, who is one of the keenest writers on political matters, in considering the subject, points out in a letter recently addressed to the Toronto Globe that our tariff either discourages industry or is construed not so much in the general interest as in that of some particular person or company that has managed to get the ear of the financial minister. "If, for instance," he writes, "there is one kind of vessel the building of which we ought to encourage more than another, it is the barge or ship constructed of wood, for a great part of Canada is still covered with forest, and to convert that raw material into instruments of trade ought to be considered by everyone common-sense policy; but, strange to say, if we propose to build a steel vessel we are allowed to import all the materials free, whereas if we build a wooden one all the iron that goes into her has to pay a heavy duty, amounting, experts say, to 50 per cent. when everything is taken into consideration. Surely, some perverse deity presided over such provisions. Is it wonderful that the building of wooden walls has not been going on very merrily of late? There is a provision for getting part of the duty returned as drawback, but it amounts to so little and there is so much trouble to get it that vessel builders declare it to be not worth considering. In connection with the tariff on iron a curious instance of care for a special interest may be cited. The list says that plate of iron and steel is to be taxed 30 per cent. Then it says that plate of iron or steel not less than 30 inches wide, etc., pays only 12½ per cent. One of our captains of industry imported plate 24 inches wide and had to pay the 20 per cent. He called attention to the undeniable fact that the distinction in the tariff is founded on no principle and is purely arbitrary, but in vain. No doubt the 20-inch interest had lobbied for itself, and his only hope lay in lobbying. He would not lobby, and therefore had to pay. Such legislation raises a good many questions with thinking men."

## A Criticism for the Man on the Dock.

Editor MARINE REVIEW: "Few men are acquainted with facts, and still fewer reason from them." Your "tipper" in last week's issue seems to have a dislike for a fine looking vessel. In his enthusiasm he cries "let there be whales," but that is not enough. The people want to know more about this craft before adopting it. I have heard of a whale swallowing a man, but the thought of a man swallowing a whale is not wholesome. It does not go down as yet. It would hardly be right to give up years of experience in ships for an animal that has no beauty, and regarding whose age or future usefulness there are grave doubts. The patentee of the "whale" is credited with saying that there is nothing in ship building, but when the "Pigs vs. the Soo" comes up Americans will probably learn something about the rule of thumb in ship building that will enlighten them. In comparing the whaleback with another vessel of the same dimensions, it is not the thickness of plates but the area of the sections that should be considered. The girth of the "pig" is less than that of an ordinary vessel of the same dimensions, and I have yet to hear of any thicker plate to compensate for the loss.

It is but natural that people should laugh at vain vancies. "Go and see the grain like brose on the inside of the pigs," is an expression that I have heard repeatedly. But this is not to be wondered at, as it is generally known that the water bottoms of many of these vessels were not tested before leaving the ship yard. There is a vast difference between the patentee of the whalebacks and the designer of the lightest constructed vessel on the lakes. The former was working by chance with nothing to lose and everything to gain, while the latter, a first class naval architect with well matured plans, was risking a reputation already made for the benefit of the shipping industry, in constructing a light vessel to meet certain conditions that demanded extreme measures. It is not strange that the Detroit press entertains a dislike for the whalebacks. The representatives of the press in Detroit have witnessed the growth of ship building on the lakes, and their city has a reputation over the world for modern practice. As the first city on the lakes to begin building steel ships on a large scale, Detroit is the home of the industry, and it is no wonder that the newspapers resent the charge that "there is nothing in shipbuilding." They can hardly be expected to have faith in vessels that are built without the advantages derived from years of practical study, which they have seen their builders give to the industry. However, time will tell—when the debate of the "porkers" comes off.

THE MAN OFF THE DOCK.

Cleveland, Nov. 15, 1893.

A CHANGE ON THE NICKEL PLATE ROAD.—The new winter schedule will take effect Nov. 19. Trains Nos. 3 and No. 4, scheduled to run between Cleveland and Chicago, will run daily except Sunday. All other passenger trains daily including Sunday. The through east-bound trains will be run about one-half hour earlier, and west-bound trains from five minutes to one-half hour later. The Wagner palace sleeping cars will be attached to all through trains, and the company will continue to operate their unexcelled palatial dining cars.

Photographs of the Albany and Philadelphia, sunk off Point au Barques last week in 200 feet of water, $1 each. Order at once from the MARINE REVIEW, No. 516 Perry-Payne Building, Cleveland, O.

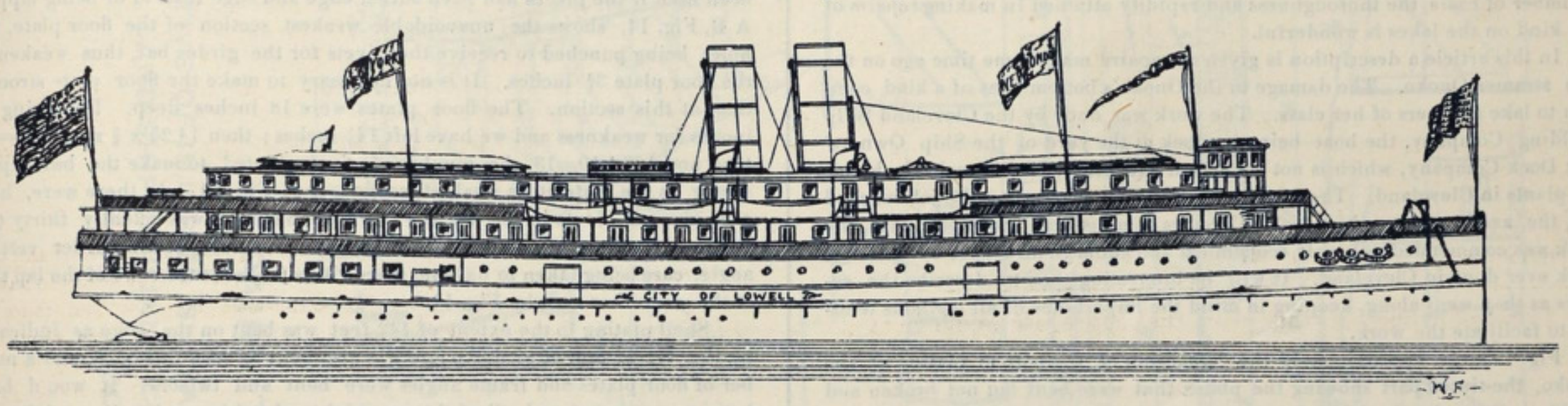
The publication containing proceedings of the marine and naval branch, engineering congress, is about ready for delivery. Order through the MARINE REVIEW. Price $10 on delivery.

Two dollars sent to the MARINE REVIEW, No. 516 Perry-Payne building, Cleveland, O., will bring two photographs, one of the Albany and one of the Philadelphia.

## New Sound Steamship City of Lowell.

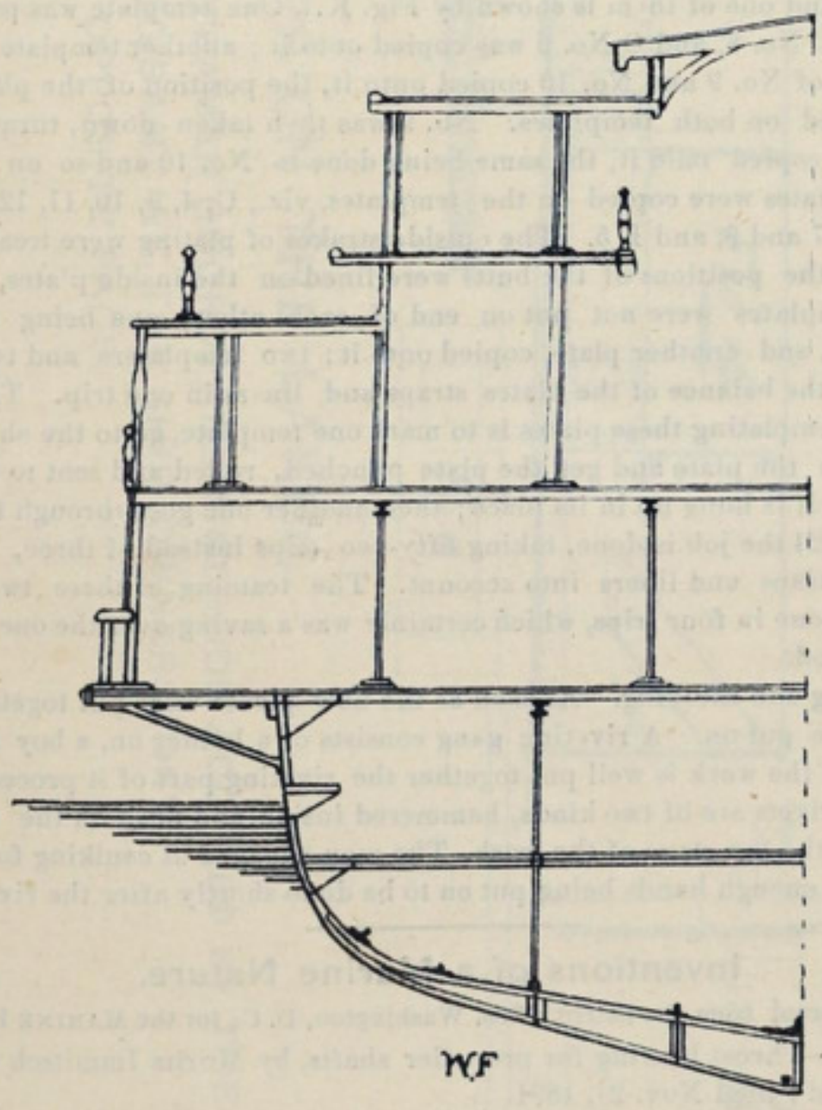
*(By William Fairburn.)*

A new twin-screw steel passenger steamer, the City of Lowell, designed for the Norwich and New York Transportation Company by A. Cary Smith of New York, is now being constructed at the Bath Iron Works, Bath, Maine, and will be placed on the route between New York and New London in the early part of 1894. When completed she will bear the same relation to the magnificent sound steamers that the Cleveland-built Great Northern and North America will bear to the passenger steamships of the great lakes. The principal dimensions of the City of Lowell are: Length of keel, 320 feet; length over all, 336 feet 1 inch; beam, moulded, 49 feet 6½ inches; beam, over guards, 66 feet; draught, loaded, 13 feet; depth, main deck to keel, 20 feet 4 inches; tonnage, 2,400 tons.




NEW TWIN-SCREW STEAMER CITY OE LOWELL.

The hull is constructed entirely of steel, with four complete transverse watertight bulkheads. She has five decks named respectively lower, main, saloon, gallery and hurricane, and all the work above the main deck, with the exception of the machinery and boiler hatch casements and also a few deck beams, which are placed for additional strength, will be of wood. The lower decks forward and aft are devoted entirely to the crew and




SECTIONAL VIEW, CITY OF LOWELL.

free-berth passenger accommodation, there being ninety free berths forward and 102 aft, while forward of all the crew, deck hands and table waiters, sixty in number, are berthed also the three second class cooks. About 200 feet of the main deck amidships is devoted exclusively to freight and is seperated from the living spaces in all respects. On the after part of this deck is a commodious social hall, just aft of which is a hallway containing a handsome staircase, which leads to the saloon deck; also a gentlemen's wash room and comfortable quarters for the purser and freight clerk. Aft of all is situated the ladies cabin containing six double-berth staterooms, twenty-seven free berths and the necessary wash rooms, etc. At the forward end of the deck is placed the Hyde patent steam windlass and the Williamson steam steerer. There is also berth accommodation for ten firemen and four coal passers on the port side, while the mess rooms, water closets, etc., for the crew are on the starboard side.

The saloon deck is devoted entirely to the accommodation of first class passengers, and contains eighty-one double-berth state rooms and twenty-five rooms with brass bedsteads. About midships are the engine and boiler hatches, and the former is so arranged that the passengers can see right into the engine room and watch the working of the powerful machinery.

The dining room, kitchen and smoking rooms are on the gallery deck, and also thirty-five double-berth state rooms. At the forward end is the pilot house, just aft of which and in direct communication are the staterooms for the pilot and captain. A large dining room then extends for sixty-eight feet the whole width of the deck, a stairway from here leading to the hurricane deck. The space around the engine and boiler hatches contains the cafe, officers dining room and staterooms for the cashier, stewards and first class cooks on the port side, and the kitchen with staterooms for the engineer, mate, oilers, etc., on the starboard side. At the extreme aft end of this deck are the staterooms for passengers. A gallery or balcony is placed here, and a handsome staircase leads below to the saloon deck.

The propelling power consists of two independent sets of vertical inverted direct acting triple expansion engines, driving twin screws, the cylinders being 26, 40 and 64 inches diameter, respectively, with a common piston stroke of 36 inches. The engines have been especially designed by Charles E. Hyde, superintendent of the engineering department of the Bath Iron Works, a man well known by engineers as having designed and superintended the construction of the first triple expansion engine built on this continent. The boilers are six in number and of the Scotch return tubular type. Their length is 12 feet 10 inches and diameter 13 feet 6 inches. They are each fitted with three corrugated furnaces 43 inches in diameter, and are designed for a working pressure of 165 pounds to the square inch. The boilers are placed three on the starboard and three on the port side of a boiler room 44 feet long by 49 wide, and two oval smokepipes 9 feet by 7½ feet carry off the refuse gas and smoke. The total estimated I. H. P. of the engines is, including all auxiliaries, 4,600, which with 125 revolutions per minute is designed to develop a speed of 20 knots, or over 23 miles per hour. The engines, boilers and coal take up 14 feet of the vessel's length amidships, the total coal bunker capacity being 90 tons, sufficient for the vessel to steam one round trip. The vessel is to be fitted with Horace See's patent ash apparatus and with Worthington pumps throughout. The electric plant will consist of two units each including a large dynamo and 70-H. P. straight line engine. Each unit will be capable of lighting the entire ship, there being 700 lights, and also a powerful search light of the most approved pattern on the pilot house. The electrical plant will be placed in the main engine room and the dynamo and engine will be connected by a belt. The vessel will be fitted throughout with electric light fixtures from Page Bros. & Co. of Boston. The following boats will be carried: Six 22-foot metallic life boats; two 20-foot wooden boats, clinker built and square stern; one 15-foot wood dinghy, and two life rafts. The steamer's three anchors will weigh 2,800, 2,200 and 1,800 pounds respectively. She will have no spars. In every respect the City of Lowell seems likely to fulfill Mr. A. Cary Smith's prophecy, that she will exceed in power, speed, capacity and elegance any boat on the American coast.

## Repairs to Metal Ships.

A DESCRIPTION WITH DRAWINGS OF A LARGE JOB ON THE IRON STEAMER ONOKO—HOW WORK OF THIS KIND IS HURRIED.

On account of the shallow and crowded condition of the connecting channels of the lakes, accidents to metal vessels are of frequent occurrence, and the ship builders of several lake cities, notably those of Cleveland, Detroit and Buffalo, have exerted themselves to a wonderful degree of economy and dispatch in the repair work that follows. To avoid delay in dry dock, or even an extra day or two of idleness in port where repairs are above the water line, is one of the main objects to be attained, but the economical management of large forces of mechanics often employed on such work is also a feature of importance. There are, of course, small jobs that will take up almost as much time as large ones, and the location of the work also presents disadvantages at times, but as a rule the work is done with satisfaction to all concerned, and in a number of cases the thoroughness and rapidity attained in making repairs of this kind on the lakes is wonderful.

In this article a description is given of repairs made some time ago on the iron steamer Onoko. The damage to the Onoko's bottom was of a kind common to lake steamers of her class. The work was done by the Cleveland Ship Building Company, the boat being in dock at the yard of the Ship Owners' Dry Dock Company, which is not connected with either of the steel ship building plants in Cleveland. The total number of men engaged on the job reached 200, the average being about 150. Upon its completion in fourteen days, the work was commended as highly economical and equal in all respects to the best work ever done in Cleveland. It will be interesting then to describe the repairs as they went along, keeping in mind the importance of all methods tending to facilitate the work.

Fig. 1 shows approximately the expansion of the bottom plating of the Onoko, the tinted part showing the plates that were bent but not broken and the black lines showing the plates that were broken. Immediately after the survey the sizes of plates were taken, and the plates were ordered from the makers at once, so that no delay would occur when the workmen were ready for them.

Center-marking rivets and preparing staging.—In order to avoid loss of time by drillers, it is necessary to locate and mark the large number of rivets that must be removed in such work. This is done by putting a center-punch mark in the center of the rivets, thus guiding the drillers and preventing the drill from glancing off. A staging must be built, as seen by Fig. A, so that the distance from the shell plate to the top of the plank will be no more than the measurement over the rachet brace and drill. On this job, fifteen men were started in the afternoon after the survey to center-mark the rivets and build staging, and on the following morning the number was increased to 135.

Drilling.—This is the most important part of the work in its early stages. B, Fig. A, shows the drill penetrated into the rivet to the depth of the countersink, better seen by *a a* and *b b* Fig. C, *b b* being the plan of *a a*. Every effort was made to keep the rachet-braces at work continually from 7 a. m. until 5:30 p. m. There were seventy-five rachet-braces in use and they were spaced 2 feet apart, working from amidships forward and aft on B and C strakes and leaving the rivets as seen by *a a* Fig. C. Two boys were employed in replacing the drills when they got out of order. They carried the tools to and from the work shop where they were dressed, ground, etc.

Backing out rivets.—Fig. B shows the backing-out punch in place in the rivet hole *a a*, Fig. C, and the hammer striking it, the force of the latter driving out the rivet. The rivet hole after the rivet is backed out is shown by *d d*, Fig. C, the black rim being the countersunk part of the rivet left in the hole. The men engaged in this work were in pairs and followed up the drillers about 4 feet apart. Still another small force followed up the gang who were backing out the rivets, and they were engaged in putting a few bolts into the rivet holes, to hold the plates in place until ready to be taken down. After a length of three plates was reached, shores were put under them, the bolts taken out and the shores knocked away, letting 36 feet of plating fall to the bottom of the dock. The rivets were then cut out of the butt straps left on the plates, and the plates taken out and landed on the roadway.

Chippers.—The shell plates being removed, this class of mechanic was put on to cut out the bad parts of the floors, as seen by Figs. 3, 4, 5, 6, 7 and 9, and in a few days the inside of the vessel appeared as indicated by Fig. 8.

Tool dressing.—Tool dressing is of considerable importance in connection with all work of this kind. The nearer the tool dressing shop is to the job, the greater the dispatch to be expected, and the Cleve and Ship Building Company has accordingly located a work shop alongside the dry dock in order to secure all the advantages that may be obtained from this source.

Templating floor plates.—The templaters made patterns for the new pieces of floor plates, frame angles and reverse frame angles, as seen by Figs. 10, 11, 12, 13 and 15. While these pieces were being prepared at the shipyard, the lap holes were being drilled through the floor plate in the vessel, as shown in Fig. 14. The templater, before marking the template for the piece of floor plate, arranged the number of rivet holes on the floor plate with chalk, and then center-marked them with a large center punch. After the templates, Figs. D and E, were in place, a light stroke with the hammer on the pattern opposite the center mark left the impression of the center mark on the template; the driller being careful in drilling the hole to the mark and the templater in copying the mark on the plate. The advantage of this method of drilling the holes last, was the saving of the time it would take the drillers to drill the holes, which meant a good deal, inasmuch as there were seventy-four floor plates with ninety-one butts and as each butt contained sixteen holes, the total was 1,456 holes. Each templater made four templates, and at the ship yard laid off five pieces from each, viz., floor plate, frame angle, reverse frame angle, frame angle strap and reverse frame angle strap, in all twenty pieces. A considerable saving was effected also in lapping the floors, instead of following the usual practice of double strapping them. When the floor plates are strapped, it is necessary to chip the plates after the bad pieces are removed, so that the edge will be perfectly straight and permit of a good joint being made. When lapped there need be no second cut, however, as one plate overlaps the other, and in this job 136 feet of cutting was thus avoided. On account of this practice there was also a saving of 182 butt straps and 1,365 rivets, which would have been used if the pieces had been butted edge and edge instead of being lapped. A B, Fig. 14, shows the unavoidable weakest section of the floor plate, five holes being punched to receive the rivets for the girder bar, thus weakening the floor plate $3\frac{3}{4}$ inches. It is not necessary to make the floor plate stronger than at this section. The floor plates were 18 inches deep. Deducting $3\frac{3}{4}$ inches for weakness and we have left $14\frac{1}{4}$ inches; then 14.25 x $\frac{3}{8}$ x 22 tons=126 tons, and 126÷10=13, the number of rivets wanted to make the butt-lap as strong as the plate at its weakest section, A B, Fig. 14. As there were, however, sixteen rivets in the lap, the riveted connection was actually thirty tons stronger than the plate through the line of rivet holes at the girder vertical angle; care being taken to have no more rivets in the outer rows of the lap than at the girder bar seen by Fig. 14.

Shell plating to the extent of 142 feet was bent on the edge as indicated by Fig. H; 22 feet of girder plate was also bent as seen in Fig. 2, and a number of floor plates and frame angles were bent and twisted. It would have been necessary to send all of this material to the ship yard to be straightened had it not been for the use that was made of Lucigen lights supplied by the Ship Owners Dry Dock Company. These lights were used to heat the bent and twisted material, thus making an easy task of the work of fairing plates and angles, which might have been cut out and sent to the ship yard to be straightened at a great increase in cost. Only twelve of the tinted plates shown in Fig. 2 were removed and straightened at the ship yard.

Templating shell plating.—As seen by Fig. 1 there were twenty-six plates broken on the shell, which had to be renewed. One templater and a boy copied twelve plates on six templates, and in the ship yard marked off plates and straps, thus preparing twenty-three pieces and only taking one trip from the dry dock to the ship yard. These templates were made in the ship yard before hand, and one of them is shown by Fig. K. One template was put up on the end of C No. 8, and C No. 9 was copied onto it; another template was put on the end of No. 9 and No. 10 copied onto it, the position of the plate butts being marked on both templates. No. 9 was then taken down, turned over and No. 11 copied onto it, the same being done to No. 10 and so on until all the inside plates were copied on the templates, viz., C, 4, 9, 10, 11, 12, 13 and 15, A, 2, 6, 7 and 9, and E 5. The outside strakes of plating were treated similarly, only the positions of the butts were lined on the inside plates, so that the two templates were not put on end of each other, one being marked, turned over, and another plate copied onto it; two templaters and two boys completing the balance of the plates straps and liners in one trip. The usual method of templating these plates is to mark one template, go to the ship yard, reverse it on the plate and get the plate punched, rolled and sent to the dry dock, where it is hung up in its place; then another one goes through the same process, until the job is done, taking fifty-two trips instead of three, without taking the straps and liners into account. The teaming of these twenty-six plates was done in four trips, which certainly was a saving over the one plate at a time method.

Riveting and caulking.—As soon as the new pieces were put together, the riveters were put on. A riveting gang consists of a holder on, a boy and two riveters. If the work is well put together the riveting part of it proceeds rapidly. The rivets are of two kinds, hammered inside and flush on the outside. Caulking is the last stage of the work. The men engaged at caulking follow up the riveters, enough hands being put on to be done shortly after the riveters.

## Inventions of a Marine Nature.

Specially reported from the patent office, Washington, D. C., for the MARINE REVIEW.

508,170—Thrust bearing for propeller shafts, by Moritz Immitsch of London, England; filed Nov. 21, 1891.

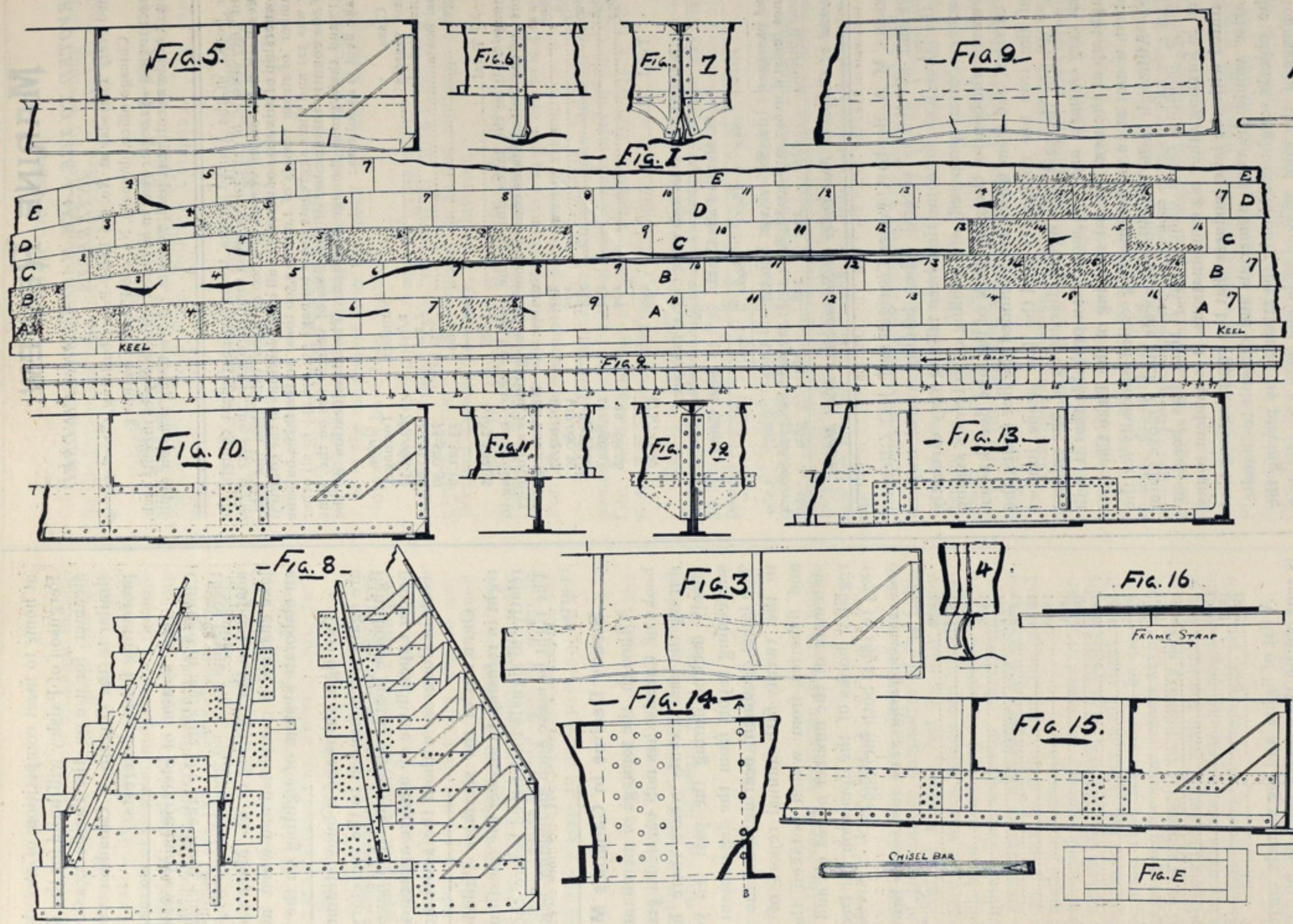
508,234—Life saving grapnel, by James B. Noble and Charles G. Thomas of Southampton, England; filed March 28, 1893.

508,260—Ice breaking apparatus, by Erich J. Weederman of Flensburg, Germany; filed Sept. 17, 1892.

508,271—Drag for steering vessels, by Louis Boucher of West Superior, Wis.; filed May 11, 1893.

508,324—Propeller, by Frank J. Leisen of Woodbridge, N. J.; filed Dec. 27, 1892.

508,334—Propeller or floating vessel, by Charles F. Osborne of Cape Town, Cape Colony; filed Feb 20, 1893.




## REPAIRS TO METAL SHIPS ON THE LAKES.

DRAWINGS DESCRIPTIVE OF INJURIES SUSTAINED BY THE IRON STEAMER ONOKO, AND METHODS ADOPTED BY THE CLEVELAND SHIP BUILDING COMPANY IN REPAIRING SAME AT THE SHIP OWNERS' DRY DOCK, CLEVELAND—SEE OPPOSITE PAGE.

# MARINE REVIEW.

*DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.*

Published every Thursday at No. 516 Perry-Payne building, Cleveland, O.
Chicago office, (branch), No. 706 Phoenix building.

SUBSCRIPTION—$2.00 per year in advance. Single copies 10 cents each. Convenient binders sent, post paid, 75 cents. Advertising rates on application.


The books of the United States treasury department contain the names of 3,657 vessels, of1,183,582.55 gross tons register in the lake trade. The lakes have more steam vessels of 1,000 to 2,500 tons than the combined ownership of this class of vessels in all other sections of the country. The number of steam vessels of 1,000 to 2,500 tons on the lakes on June 30, 1892, was 321 and their aggregate gross tonnage 534,490.27; in all other parts of the country the number of this class of vessels was,on the same date, 217 and their gross tonnage 321,784.6. The classification of the entire lake fleet is as follows:

| Class. | Number. | Gross. Tonnage. |
|---|---|---|
| Steam vessels | 1,631 | 763,063.32 |
| Sailing vessels | 1,226 | 319,617.61 |
| Canal boats | 731 | 75,580 50 |
| Barges | 69 | 25,321.12 |
| Total | 3,657 | 1,183,582.55 |

Tonnage built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

| | Number. | Net Tonnage. |
|---|---|---|
| 1888 | 222 | 101,102.87 |
| 1889 | 225 | 107,080.30 |
| 1890 | 218 | 108,515.00 |
| 1891 | 204 | 111,856.45 |
| 1892 | 169 | 45,168.98 |
| Total | 1,038 | 473,723.60 |

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

| | St. Mary's Falls Canal. | | | Suez Canal. | | |
|---|---|---|---|---|---|---|
| | 1892. | 1891. | 1890. | 1892. | 1891. | 1890. |
| No. vessel passages | 12,580 | 10,191 | 10,557 | 3,559 | 4,207 | 3,389 |
| Ton'ge, net regist'd | 10,647,203 | 8,400,685 | 8,454,435 | 7,712,028 | 8,698,777 | 6,890,014 |
| Days of navigation.. | 223 | 225 | 228 | 365 | 365 | 365 |

*Entered at Cleveland Post Office as Second-class Mail Matter.*

MESSRS. M. A. Bradley, James Corrigan and J. C. Gilchrist of Cleveland, as well as several other leading vessel owners around the lakes, have for some time been talking very earnestly of the scheme, often proposed, of a pooling of interests among vessel owners who control the great bulk of the lake fleet known as wild carriers, and from which are excluded the line boats, the boats of the iron ore companies and the low grade lumber carriers. Within the past few weeks discussion of the subject has been very earnest, and it is more than probable that it will be brought up at the next annual meeting of the Lake Carriers' Association, if not at an earlier meeting called specially for the purpose. Although those who now advocate such a move claim that there is nothing more difficult in it than has been encountered in forming other big combinations, it is evident to any one acqainted with the lake business that the complications that would arise would be very numerous and difficult to handle. All of the objects sought could only be attained by placing the entire tonnage of the kind spoken of in one man's hands, but while some owners honestly talk of entering into an extreme movement of this kind, we hear reports from Buffalo about transactions in coal freights that would seem to destroy whatever little confidence there has been in any general effort to uphold freights. Coal freights out of Buffalo have been quite steady this season. It has been a matter of comment that fluctuations were unimportant, and now comes the charge from a very good authority that certain vessel owners, irrespective of any action from brokers and without the knowledge of the brokers, have been paying rebates to shippers with whom they had an understanding that provided for steady employment for the boats of these owners in return for the rebate.

---

CANADA has gone to England for another small naval vessel, on account of the inability of a few weak shipbuilding concerns at home to meet competition of any kind. Messrs. Fleming & Ferguson of Paisley will build for the dominion an armed service steamer for use on the Pacific coast. She is to be somewhat similar to the Quadra, a Canadian vessel already engaged in protecting fishing interests.

---

IF A system of electric buoys was successfully operated at Chicago in marking the lake front channel to the fair grounds, there seems to be no good reason why these buoys can not be adapted to the lighting of St. Mary's river, when the new Hay lake channel is completed and when all conditions will warrant an elaborate system of lighting on the river.

---

Two light-ships and a buoy steamer for the Atlantic coast are again reccmmended to the secretary of the treasury by the light-house board, while the lakes have difficulty in securing the proper expenditure of meagre appropriations obtained by hard work in Congress without the assistance of the board.

---

OFFICERS of the steamers Philadelphia and Albany were right in refusing to answer the questions of a Michigan coroner relative to signals exchanged before their boats met in collision. The right to make such an inquiry belongs only to the federal courts.

---

## Steady Decline in Canada's Merchant Tonnage.

Although the tonnage of merchant vessels on the register books of Canada has not varried a great deal in the aggregate during the past twenty years, there has been a moderate but steady decline during the past ten years, as shown by each succeeding report from the department of marine and fisheries. The latest document bearing upon the subject is a supplement to the twenty-fifth annual report of the minister of marine and fisheries, from which is taken the following comparative statement of the number of ves els and number of tons on the registry books of the dominion on Dec. 31 in each year, from 1873 to 1892, both inclusive:

COMPARATIVE STATEMENT OF TONNAGE ON THE REGISTER BOOKS OF CANADA.

| Dec. 31. | No. of ves els. | Gross tonnage. |
|---|---|---|
| 1873 | 6,783 | 1,073,718 |
| 1874 | 6,930 | 1,158,363 |
| 1875 | 6,952 | 1,205,565 |
| 1876 | 7,192 | 1,260,839 |
| 1877 | 7,362 | 1,310,468 |
| 1878 | 7,469 | 1,333,015 |
| 1879 | 7,471 | 1,332,094 |
| 1880 | 7,377 | 1,311,218 |
| 1881 | 7,394 | 1,310,869 |
| 1882 | 7,312 | 1,260,777 |
| 1883 | 7,374 | 1,276,440 |
| 1884 | 7,254 | 1,253,747 |
| 1885 | 7,315 | 1,231,856 |
| 1886 | 7,294 | 1,217,766 |
| 1887 | 7,178 | 1,130,247 |
| 1888 | 7,142 | 1,089,642 |
| 1889 | 7,153 | 1,040,481 |
| 1890 | 6,991 | 1,024,974 |
| 1891 | 7,015 | 1,045,475 |
| 1892 | 7,007 | 964,129 |

A list of lights and fog signals, corrected up to Jan. 1, 1893, is sent out by the department with the supplement here referred to. These lists of aids to navigation are always of service to masters of vessels of the United States, as well as masters of Canadian vessels.

---

## Opening of the Cleveland Dry Dock.

After about two years of patient labor against many disadvantages, the management of the Cleveland Dry Dock Company is finally in readiness to put a vessel in its new dry dock, in the construction of which most aggravating delays have been met with through leaks and from other causes. On Saturday next the Menominee line steamer Briton will be docked in the new basin, and three large docks will then be in operation in Cleveland. Although not as long as two or three of the very big dry docks on the lakes, this new dock will have a depth on keel blocks of about 18 feet.

## Iron Mining Matters.

Shipments of iron ore from Two Harbors up to and including Wednesday, Nov. 8, aggregated 879,261 gross tons and were divided as follows: Chandler, 422,862 tons; Minnesota, 358,-932; Zenith, 12,998; Cincinnati, 9,939; Canton, 24,412; Franklin, 46,608; Hale, 3,510. Shipments of Gogebic range mines through Ashland up to and including Saturday, Nov. 4, foot up 1,107,534 tons, divided among the different mines as follows: Ashland, 41,016 tons; Aurora, 173,172; Colby No. 2, 55,444; Tilden, 135,118; Germania, 6,582; Iron Belt, 23,975; Montreal, south vein, 2,606; Montreal, north vein, 31,462; Eureka, A, 1,949; Germania, "Smith," 1,381; Brotherton, 16,193; Comet, 8,385; Eureka, 29,435; Careys, 32,515; Newport, 102,891; Norrie, 228,476; East Norrie, 78,135; Palms, 2,657; Pabst, 91,891; Jack Pot, 1,651; Davis, 13,282; Sunday Lake, 20,904.

Announcement of the resumption of work at the properties of the Minnesota Iron Company is, of course, received with general satisfaction, as are also similar reports from the Norrie, Pabst, Lake Angeline and other mines that have been entirely shut down. This renewal of mining is not, however, due to any special improvement in the outlook for ore. It is prompted mainly by the low cost of production, on account of labor charges, and in the case of the Minnesota company, there is the necessity of providing business for its railway, and in order to do this, as against the steam shovel system on the Missabe, the ore must be mined, crushed and placed in stock pi es during the winter.

Ferdinand Schlesinger is working hard to overcome the financial difficulties that were thought to have stranded him several months ago, and it is the opinion of people well posted in the iron business that he will soon be heard from again in the Lake Superior region.

Minority stockholders are said to have secured control of the Ashland mine at Ironwood.

Chapin's shipments for the season aggregate 484,370 gross tons.

## Lake Carriers' Association.

Several matters of a general nature were discussed at the regular monthly meeting of the finance committee of the Lake Carriers' Association in Cleveland, Monday, but the only action of importance was with regard to wages, which are usually advanced in the fall, but which have ruled low on account of the depressed condition of freights. The wages of wheelmen, firemen, watchmen and oilers on steamers, and sailors and cooks on tow barges were made $1.25 a day, to date from Nov. 13, and wages of deck hands were made $20 a month.

Secretary Keep was instructed to notify the board of supervising inspectors of steam vessels that the system of lights at the at present in use on tow barges on the lakes is all right, and it is the desire of the association that lake vessels be exempted from any rules that may be adopted for such vessels at the meeting of the board to be held in Washington in January next.

Mr. Keep was also instructed to confer with the light house board with a view to delaying to as late a date as possible the work of taking up the principal buoys in important channels throughout the lakes.

## Society of Naval Architects and Marine Engineers.

In addition to the papers already announced for the inaugural meetings of the Society of Naval Architects and Marine Engineers, which will begin in New York today, Col. Edwin A. Stevens, president of the Hoboken Ferry Company, will read a paper on "Some Thoughts on the Design of New York Ferry Boats," and the subject of a paper by William Gardner, naval architect, will be "Steam Yachts as Naval Auxiliaries in Time of War." Prof. W. F. Durand of Cornell University is also expected to read a paper, the subject of which is "The Law of Frictional Resistance." Messrs. A. Cass Canfield, member America's cup committee, New York yacht club, and Joseph H. Linnard, naval constructor, U. S. N., were prevented at the last moment from contributing papers. The banquet Thursday evening will be in the Brunswick hotel, Madison Square.

Special attention will be given to the REVIEW during the winter to freight matters for the coming season. Owners, masters and others who will be away from leading ports should subscribe now.

## Around the Lakes.

During thirty-six hours ending Monday evening, clearances on the Erie canal from Buffalo amounted to 815,000 bushels of grain.

Langell & Sons of St. Clair, Mich, have incorporated their ship yard interests. The concern will in the future be known as the Langell & Sons Ship Building Company. The capital is $150,000.

With a resumption of work on the Peck steamer at Wyandotte, it is probable that a very strong effort will be made to provide other contracts for the steel plant of the Detroit Dry Dock Company.

A very large part of the gain this season of 64,000,000 feet in lumber shipments through the St. Mary's Falls canal to Nov. 1, is in the movement from the head of Lake Superior, where shipments have been doubled.

Claims against the steamer Fountain City, which is to be sold by the United States marshal at Milwaukee, Nov. 22, aggregate $8,500. This includes the $4,000 mortgage held by the Western Transit Company, with interest.

John H. Gillett of Marquette, who bought the wrecked schooner Neelon and released her from Manitou island, is patching the boat up and will probably try to get her to a dry dock at Port Huron or some other point on the rivers.

Harvey Neelon, a well-known lake captain and vessel owner, formerly of Port Dalhousie, and later of St. Catherines. Ont., died Saturday of heart disease. He was a brother of Sylvester Neelon, and was sixty-four years old.

Curtis & Brainard's wooden steamer Mohegan was launched Tueseay at Marine City by M. P. Lester. She is 225 feet keel, 39 feet beam and 14 feet hold, and will have a fore and aft compound engine, built by S. F. Hodge & Co. of Detroit.

It is now definitely settled that work will be stopped on one of the big Northern line passenger boats, being built by the Globe Iron Works Company, Cleveland, until the first boat can be given a trial. A large number of workmen have been laid off and the boat on which work has been suspended will be housed up.

A correspondent at West Bay City reports that Capt. Burke was presented with a valuable cane by W. D. Young and the crew of the lost tug Acme, who desired to make acknowledgment of his bravery. Work has been commenced on a rebuild above the water line of the tug Ella M. Smith, at West Bay City, and the Charlton will probably go to Owen Sound to be lengthened 15 feet.

Principal dimensions of the new ferry steamer to be built by F. W. Wheeler & Co. of West Bay City for the Detroit Belle Isle and Windsor Ferry Company are: Length over all, 140 feet; length on water line, 126 feet; beam, 39½ feet; beam, water line, 34½ feet; extreme breadth, 51 feet; moulded depth, 14 feet; draught, 12 feet. The engines will be compound. She will have two steel boilers 10 feet in diameter and 12½ feet long. The boat is to be completed and ready for business by June 1, 1894.

The survey of the steamer Colonial, which was wrecked on Pigeon Island reef, Lake Ontario, last month, and was abandoned to the underwriters as a total loss, but which is now in Cleveland, has been completed. The steamer is again the property of the original owners, as the estimated figures of the surveyors fall several thousand dollars short of making her a constructive total loss. The estimated cost of repairs on the hull is $15,362.85, and on the machinery $4,650. Surveyors' fees are included in these figures. The wrecking bill and temporary repairs at Kingston cost about $9,000, making the total loss $29,-012.85, or about $7,000 below the amount that would make her a constructive total loss.

## Fuel at Detour Docks.

Managers of the new fuel docks of Pickands, Mather & Co., at Detour, desire to have it understood that steamboats can secure fuel at these docks with the least possible delay at any hour of the day or night. The docks contain six pockets, and there is a plentiful supply of fuel in readinesss to be dumped into the bunkers of steamers at all times.

British charts of Lake Superior cover the entire north shore. $1.

### Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store at the principal points of accumulation on the lakes on Nov. 11, 1893:

| | Wheat, bu. | Corn, bu. |
|---|---|---|
| Chicago | 18,916,000 | 1,956,000 |
| Duluth | 6,796,000 | ..... |
| Milwaukee | 834,000 | ..... |
| Detroit | 1,241,000 | 10,000 |
| Toledo | 2,107,000 | 254,000 |
| Buffalo | 2,239,000 | 733,000 |
| Total | 32,133,000 | 2,953,000 |

At the points named there is a net increase for the week of 174,000 bushels of wheat and a net decrease of 739,000 bushels of corn.

### A Hogshead used for a Life Car.

In a collection of dismal stories of shipwreck, a writer in the New York Herald tells of the use of a hogshead in saving life from a stranded ship in the days when the patent life cars, which are now a part of the equipment of all life saving stations were unthought of. It was away back in 1846 that the packet ship Henry Clay was wrecked at Squan Beach on the Jersey coast. Flying before a terrific gale the ship struck the beach at midnight. There she lay thumping on the sand, while her frenzied crew and the passengers heaved two hundred bags of salt overboard. The masts were cut away to ease the ship. There were 270 passengers on the Henry Clay, but they kept their courage, when in the early morning light they saw a crowd of men on the beach preparing to save them. Six lives were lost in the attempt to land passengers, but the second mate and four men succeeded in getting a line ashore. When darkness came on again a crew of fearless surfmen managed to reach the wreck, but the captain would not attempt to land the passengers in such a sea. All night the storm increased and the passengers were overcome with terror. Strong men gave themselves up to transports of despair, and the women and children lay about in groups dumb with fear. At the peep of day the Jerseymen were on the alert. The ship had worked around with her stern toward the beach. Captain Nye of the Henry Clay rigged a derrick on the taffrail, to which a strong hawser was secured. The other end was hauled on shore and made fast. A hogshead was safely lashed and slung, with a traveller and hauling lines. Then in twos and threes the passengers and crew crawled into the hogshead and were hauled across the booming, white-jawed breakers without even wetting their feet, while the surfmen worked up to their necks in water.

### In General.

W. K. Vanderbilt's big new yacht, the Valiant, is at present fitting out at New York for a two years' cruise around the world, starting first to the Mediterranean.

The engines of J. Harvey Ladew's new steam yacht Columbia, built by the Cramps, are duplicates of those on the dynamite gunboat Vesuvius, and will develop about 1,600 horse power. They have turned up as high as 230 revolutions per minute. —American Ship Builder.

Secretary Carlisle is reported by a New York newspaper as saying that James A. Dumont will remain at the head of the steamboat inspection service during President Cleveland's term in office. The report is probably without foundation. Gen. Dumont may retain his position, but it would be very impolitic of the secretary to make such a declaration.

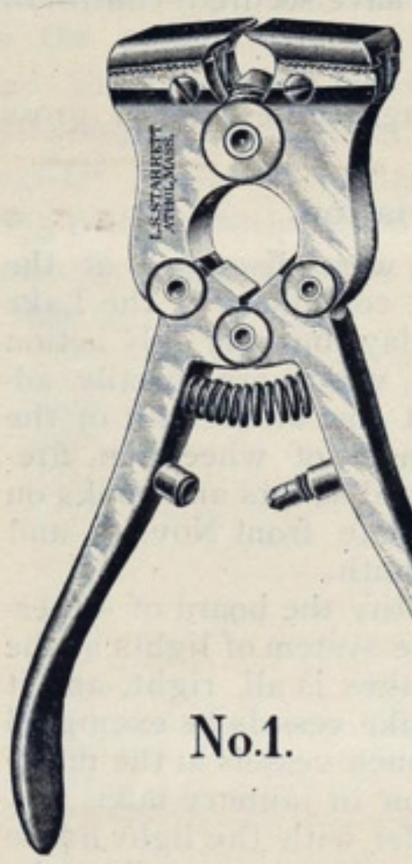
A short time ago the schooner Netherby Hall took a cargo of 165,711 bushels of wheat from Newport News, Va., to Antwerp. The cargo was said to be the largest ever shipped from an Atlantic port, but the statistician of the New York Produce Exchange announces that the St. Pancras carried to Antwerp in 1891 a cargo of 197,893 bushels of wheat, besides 9,801 bushels of rye, and he finds also that the Great Eastern in 1864 took 360,000 bushels of wheat, besides several thousand boxes of bacon.

Secretary Herbert has selected a special board to inquire into the best and most economical method of correcting the defects reported to be existing in some of the vessels of the new navy. The duty of the board will be to determine which should be adopted of the several plans submitted to the navy department for the redistribution or reduction of weights, &c., so as to correct the top heaviness discovered in the vessels. The ships included in the list to be investigated are the Detroit, Montgomery, Machias, Marblehead, Castine, Cincinnati and Raleigh, but it is possible that the work of the board may be extended so as to include all the vessels now under construction.

James & George Thomson, Limited, of Clydebank, have launched the steel twin-screw steamer Kensington. This is the second of the big steamers soon to be placed in service by the International Navigation Company of Philadelphia. Her dimensions are 480 feet by 57 feet by 40 feet, and she will carry 8,000 tons at a draught of 28 feet. The vessel is subdivided by nine water-tight bulkheads, and has a cellular double bottom for water-ballast. There are ten powerful steam winches near the hatches on the upper deck, and worked in conjunction with strong derricks, of which there are no fewer than sixteen, of lengths varying from from 40 to 60 feet. There is an extensive installation of refrigerating machinery in separate sections—one for perishable cargo and the other for the ship's requirements. Although intended as a cargo carrying steamer, the Kensington has accommodation in large state rooms amidships on the upper deck for about 120 passengers, and on the main deck for 1,000 emigrants. The engines are of the direct-acting, surface-condensing, quadruple-expansion type, with four cylinders working on four cranks. The cylinders are 25½, 37½, 52½ and 74 inches in diameter, and the stroke 4 feet 6 inches. The boilers are designed for a working pressure of 200 pounds per square inch, and are fitted with Messrs. Brown's induced draught and Serve tubes.

### Adjustable Jaw Cutnipper.

This tool was designed to supply the demand for a better thing in its line than has been heretofore obtainable. The jaws are detachable, so that they can be removed, ground and adjusted when they have become worn. Each jaw can be ground away to the extent of ¼ inch, remaining as good as new for practical use; and when used up, if ever, new jaws can be procured.



No.1.

These jaws have a dovetailed slot in their under side to receive a spline which extends into a slot in the frame. A tapering screw through the frame and spline draws the jaw firmly down to a toothed seat in the frame.

Another improved feature in this cutnipper is a flat spring below the cutting edges, and over the joint, forming a yielding seat for the end of the wire to press against while being cut. This obviates the danger of breaking the jaws as often happens with the other styles of cutnippers, which allow the wire to be inserted against a solid surface, thereby creating a pushing out strain on the jaws when they are pressed together. The head and handles are of drop forged steel, finely finished. All the parts are case harded except the jaws, which are made from a high grade of steel, nicely tempered. L. S. Starrett, Athol, Mass., is the manufacturer.

**FOR SALE CHEAP....**

Two new Steel Scotch Marine Boilers, 12 ft. diameter, 11 ft. long with Steam Drum, etc. Grate surface 61 feet. Sold for want of use, Apply

THE HARLAN & HOLLINGSWORTH COMPANY,
WILMINGTON, DEL.

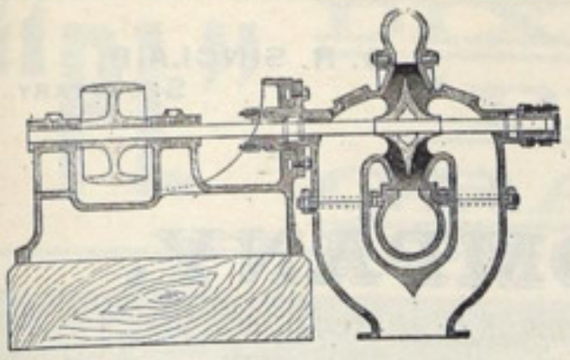
**Nautical Steam Laundry**

No. 100 RIVER STREET.

SPECIAL ATTENTION GIVEN TO MARINE WORK.

OPEN DAY AND NIGHT.
Telephone 2558

CHARLES M. SWARTWOOD, Proprietor.



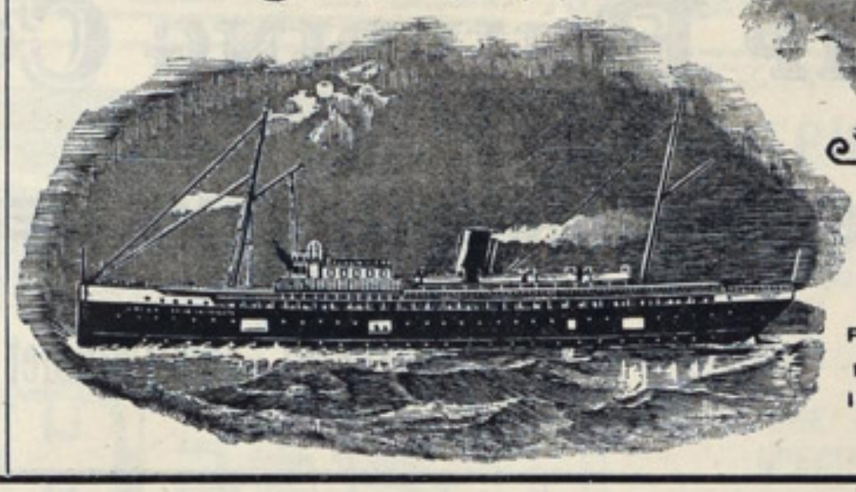
## Centrifugal Pumping Machinery

MANUFACTURED BY **LAWRENCE MACHINE CO.**

Adapted to requirements of contractors, wreckers, pumping out docks, cofferdams, and water bottoms of steel vessels.
Address for catalogue and prices,

**R. H. ALDRICH, Engineer,**
43 Builders' Exchange, BUFFALO, N. Y.

# E. S. Richardson Fueling Co.



COAL

DOCKS
FOOT NO. MARKET ST
18TH ST. BRIDGE,
ILLINOIS CENTRAL SLIP "C"

OFFICE. 54 LA SALLE ST.
CHICAGO ILL.

# MARINE VALVE OIL

**For Cylinder Lubrication is unsurpassed, and is used in 90 per cent. of the large steamers on the great chain of lakes.**

STANDARD OIL COMPANY, MARINE VALVE OIL CLEVELAND, O.

Marine Valve, Renown Engine, Eldorado Engine, Crank Case, Artic Cup Greases, Victor Signal, Dark Lubricating, and Lard Oils. Mineral Seal, Head Light,

— CARRIED IN STOCK AT THE —

## Standard Oil Company's Marine Depot

**123 River Street, CLEVELAND, O.**

TELEPHONE 77. MAIN OFFICE TELEPHONE 682.

ALSO FOR SALE BY

*STANDARD OIL COMPANY,*

No 5 Wabash Ave., Chicago, Ill.
Racine, Wis.
Broadway & Mason, Milwaukee, Wis.
Sheboygan, Wis.
Manitowoc, Wis.
Green Bay, Wis.
Marinette, Wis.
Oshkosh, Wis,
Duluth, Minn,
West Superior, Wis.
Hancock, Mich.
Marquette, Mich.
Sault Ste. Marie, Mich.
Michigan Central Railway & 10th St., West Bay City, Mich.
Eighth & Sears Sts., Saginaw, Mich.
46 Jefferson. Detroit, Mich.
Summit & Monroe Sts, Toledo, O.

STANDARD OIL COMPANY, RENOWN TRADE MARK ENGINE OIL CLEVELAND, OHIO.

ATLANTIC REFINING COMPANY, French & 16th Sts., Erie, Pa.
D. ROBESON, Port Huron, Mich.
W. S. MCKINNON, Ashtabula Harbor, O.
HULL & RAND, Huron, O.

STANDARD OIL COMPANY, Star Oil Works, Buffalo. N.Y.
BABY & DALE, St. Clair, Mich.
N. C. ALTEN, Lorain, O.
A. F. HARRINGTON, Conneaut Harbor, O.

A. H. MCGONAGIL, South Chicago, Ill.
MARINE SUPPLY CO., Fairport, O.
F. KRANZ, Sandusky, O.
THE M. I. WILCOX CORDAGE & SUPPLY CO., Toledo, O.

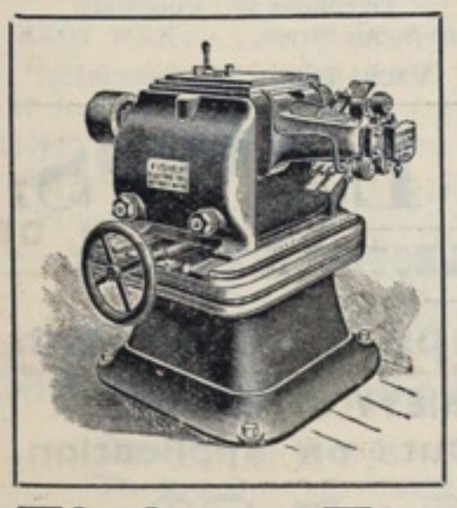
F. W. WHEELER, President.
E. T. CARRINGTON, Vice-President.
F. L. GILBERT, Secretary.

# F. W. WHEELER & CO.,

## WEST BAY CITY, MICH.

Builders of all kinds of METAL AND WOODEN SHIPS.

THE following Passenger Steamers employed at the **WORLD'S FAIR** are equipped with our Lighting Plants: We invite our friends and prospective customers to make an inspection of these Plants:



CHRISTOPHER COLUMBUS—Two 400 light direct-connected twin compound engines and dynamos with 800 lamps and search light.

ARTHUR ORR—Two direct-connected engines and automatic dynamos, 350 lamps.

CITY OF TOLEDO—Automatic belted engines and dynamo, 210 lights.

**Fisher Electric Co.** 183, 185 & 187 Larned Street, West, **Detroit, Mich.**

WILLIAM L. BROWN, PRESIDENT. W. F. COBB, VICE-PRESIDENT. W. I. BABCOCK, MANAGER. O. R. SINCLAIR, SECRETARY.

# CHICAGO SHIP BUILDING COMPANY,

LONG DISTANCE TELEPHONES.
Ship Yard Office, "South Chicago 40."
Chicago Office, 1013 Rookery, "Main 3447."

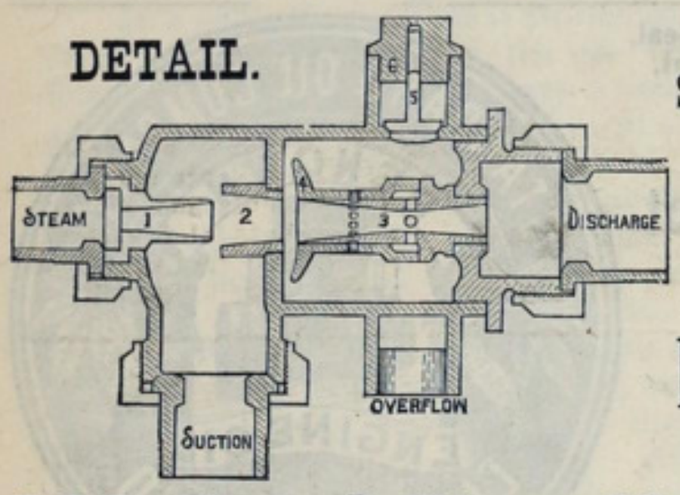
## STEEL STEAM-SHIP BUILDERS,

101st St. and Calumet River, SOUTH CHICAGO, ILL.

---

# The Globe Automatic Injector.

DETAIL.




See the SIMPLICITY OF IT!

SUPERIOR FOR MARINE BOILERS.

Write for Particulars.

Eagle Lubricator Co.
MANUFACTURERS,

108 Canal St., - Cleveland, O.

---

# THE "CINCINNATI"
AUTOMATIC
## STEAM STEERING GEAR

A Simple, Powerful Machine. Noiseless and Sure.

SEND FOR CIRCULAR.

CRAWLEY & JOHNSTON,
119-121-125 E. Pearl St., CINCINNATI, OHIO.

---

GEORGE B. CARPENTER. ESTABLISHED 1840. BENJAMIN CARPENTER.

# GEO. B. CARPENTER & CO.

## *Ship Chandlers and Sail Makers.*

CORDAGE, TWINES, COTTON DUCK,
MILL, RAILROAD and VESSEL SUPPLIES.

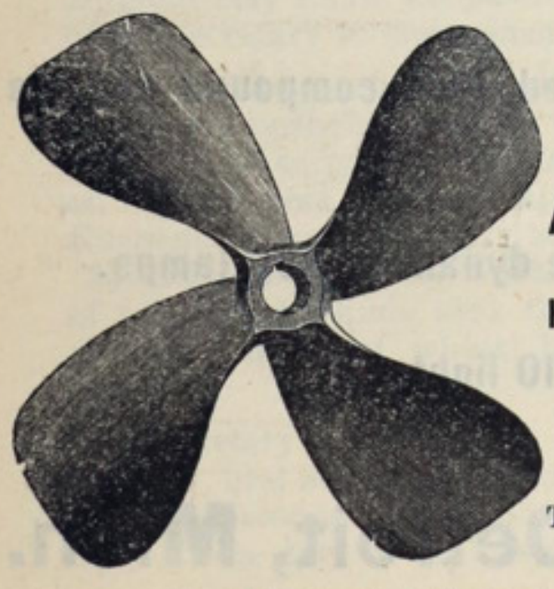
202, 204, 206, 208 So. WATER STREET,
CHICAGO, ILL.

---

# H. G. TROUT,
# KING IRON WORKS,
## BUFFALO, N. Y.,

MANUFACTURERS OF

TRIPLE EXPANSION, THREE CYLINDER, FORE AND AFT And STEEPLE COMPOUND MARINE ENGINES,



High and Low Pressure Engines, Sectional, Propeller, Tug and Yacht Wheels.

Cowles Aluminum and Manganese Bronze Propeller Wheels.

These Wheels are noted for their extra speed, towing power and proportionate saving of coal.

PRICES QUOTED ON APPLICATION.

---

# THE JENKS SHIP BUILDING CO.

Will have FOR SALE OR CHARTER by the begining of navigation, 1893,

## THREE (3) STEAMERS

Especially Designed for the Lumber Trade.

If interested, address them at PORT HURON, MICH.

---

# C. H. McCUTCHEON,

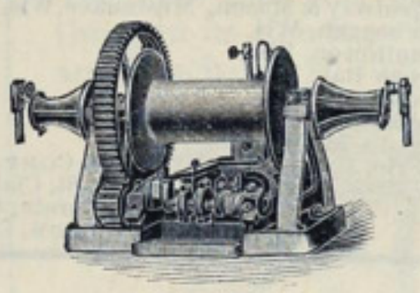
(Successor to SAMUEL McCUTCHEON.)

## Copper, Tin and Sheet Iron Manufactory,
### Steamboat and Engineers' Supplies.

All kinds of Brass Cocks, Globe Valves and Couplings, &c. Iron Pipe and Fittings, and Mill Supplies. Rubber Belting, Hose and Packings, Springs, Valves, &c., Leather Belting and Usudurian Packing.

Telephone No. 68. No. 18 Ohio Street BUFFALO, N. Y.

---



# JACKSON & CHURCH,

Builders of DUPLEX HOISTING and DECK ENGINES.

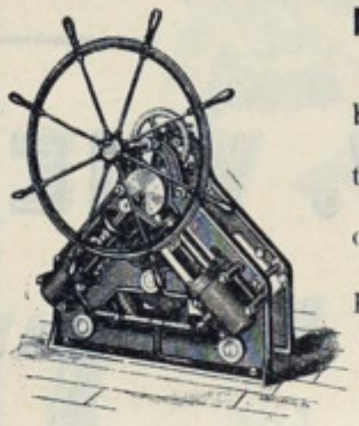
Plain Finished and Automatic **ENGINES**, From Heavy Patterns at Moderate Prices.

Vertical, Horizontal, Marine & Locomotive **BOILERS** Strictly First-Class and Highest Test.

Send for Circulars and Prices. SAGINAW, MICH.

---

# SHERIFFS STEAM STEERER.



## MADE IN TWO SIZES.

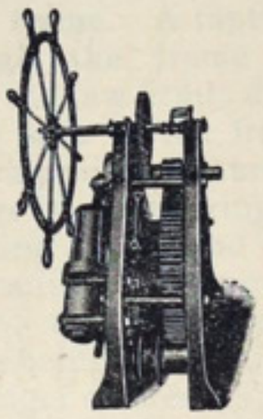
Are easy to adjust and can be handled by any one.

The Steerer can be arranged to set in pilot house or aft.

No Steerer will be sold without a quadrant.

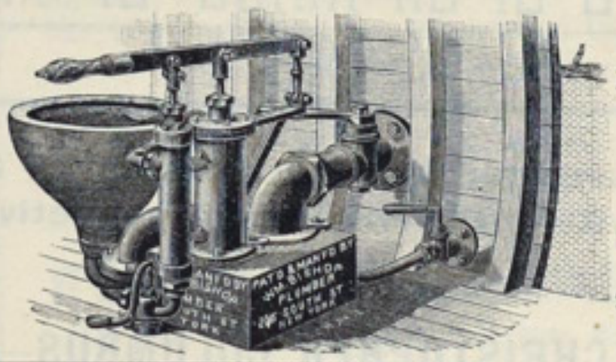
Steerer will be sold on approval.

Manufactured by
SHERIFFS MFG. CO.,
126-130 Barclay Street,
MILWAUKEE, WIS.



---

# COMBINATION PUMP WATER CLOSET



For Yachts, Pilot Boats, Naval Ships, Etc.

For above or below water line. No tank needed, and when below water line you can flush bowl without having to use pump.

WILLIAM BISHOP,
Plumber, Coppersmith & Steam Fitter,
Telephone 4811 Cortlandt,
205 South Street, NEW YORK.

Yacht Fittings a Specialty.

---

# SHIP LAMPS.

OIL AND ELECTRIC FIXTURERS
FOR
## Steamships, Yachts, &c.

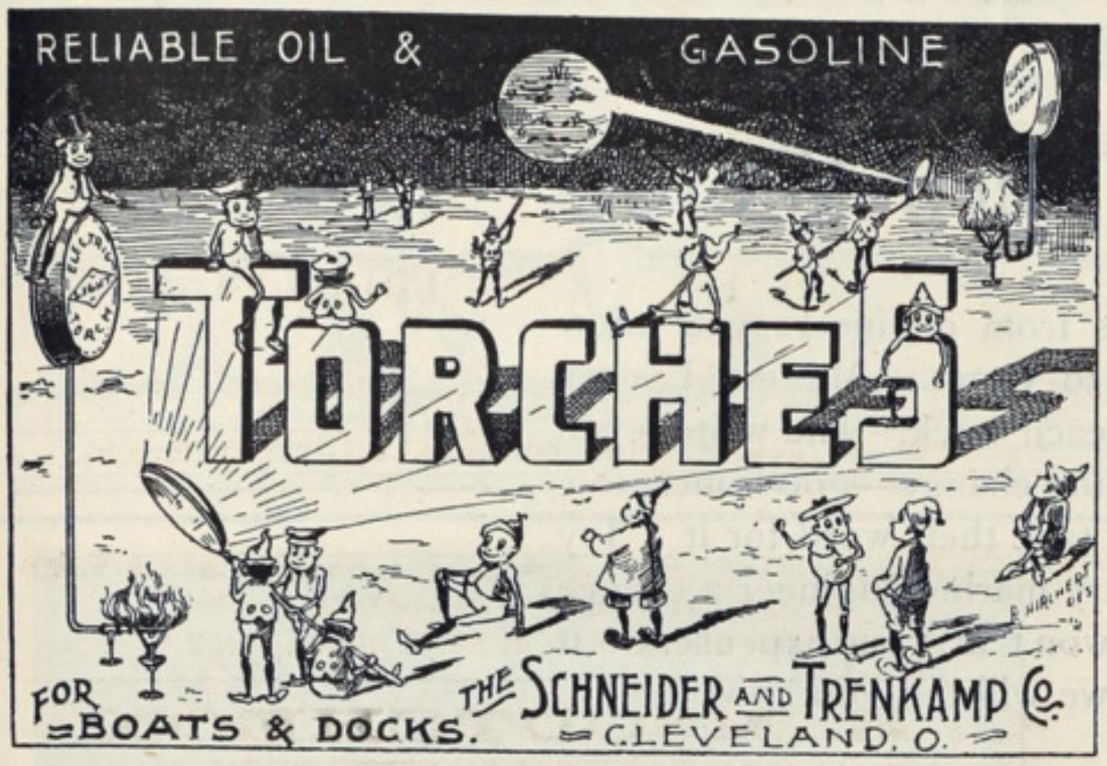
GREAT VARIETY OF DESIGNS.
Prices and Cuts on Application.

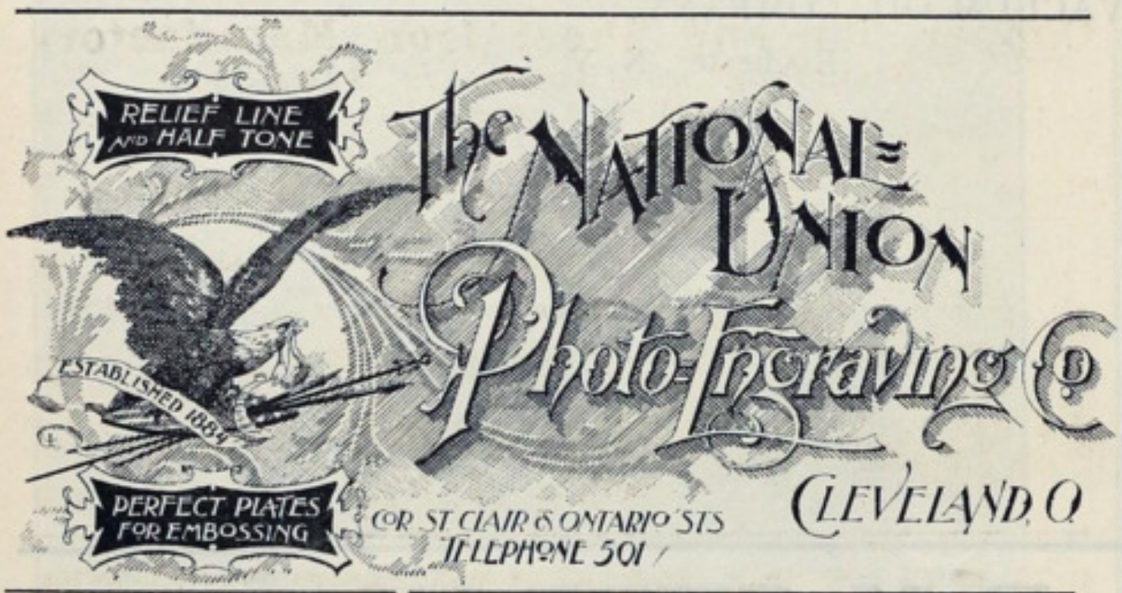
PAGE BROS. & CO.,
(FORMERLY WILLIAMS, PAGE & CO.)
227 to 233 Cambridge St., BOSTON, MASS.

# "PL" DIXON'S "PL" GRAPHITE.

Dixon's Perfect Lubricating Graphite is indispensible to every engineer and machinst. It can be used dry or mixed with water, oil or grease. We send free of charge a sample and pamphlet with interesting and instructive information.

JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.




1880. 1893.

## CHAS. H. POTTER & CO.,

## Investment Bankers,

Cleveland, O.

Dealers in

**Lake Superior Iron Mining Stocks,**

on about 10 per cent. annual dividend basis, Republic Iron Co., Lake Superior Iron Co., Champion Iron Co., Minnesota Iron Co., Jackson Iron Co., Cleveland-Cliffs Iron Co., Chandler Iron Co., Chicago and Minnesota Ore Co.

## CONNELLY BROS. & CO.

OHIO, Cor. Michigan St., BUFFALO, N. Y.

SHIP CHANDLERY, PAINTS, OILS,

AND VESSEL SUPPLIES.

ST. MARY'S RIVER CHARTS NOS. 1 AND 2 FROM POINT IROQUOIS TO E. NEEBISH AND FROM MUD LAKE ENTRANCE TO E. NEEBISH, CORRECTED TO AUG. 30, 1892, CAN BE HAD AT THE OFFICE OF THE MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, FOR 20 CENTS EACH, OR BOTH BY MAIL FOR 50 CENTS. BOTH CHARTS WILL BE FURNISHED WITH CLOTH BACKS AND BOUND EDGES FOR $1.50.

## H. CHANNON COMPANY,

**General Ship Chandlers and Sail Makers,**

Dealers in Manilla Rope, Wire Rope,
Tackle Blocks, Cotton Duck, Anchors, Chains, Etc.

24-26 MARKET STREET, CHICAGO, ILL.

## AMERICAN CHAIN CABLE WORKS.

ESTABLISHED 1865.

Cable, Dredge, Quarry, Shipping, Crane and Rafting

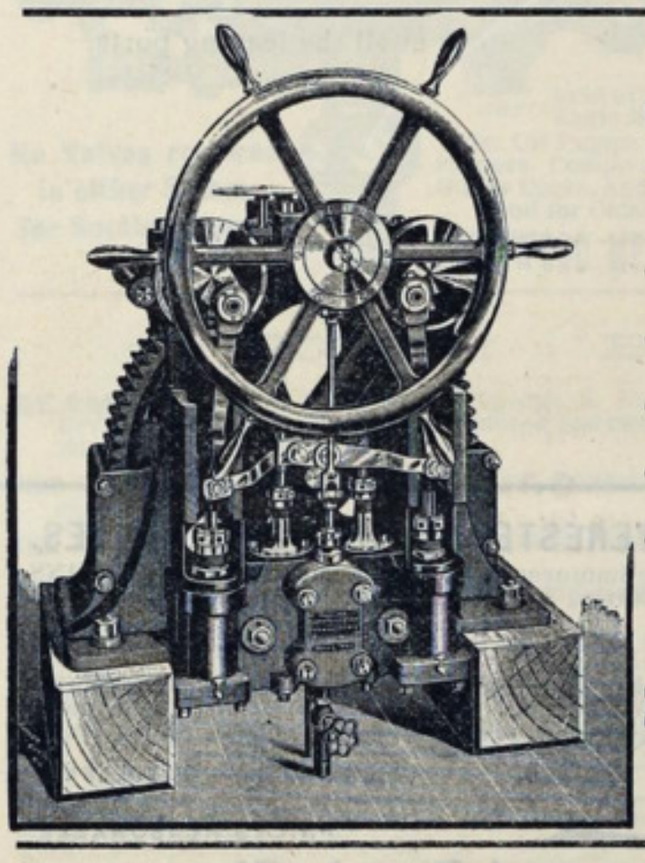
CHAINS.

Our DREDGE and CRANE CHAINS are made of IRON ROLLED SPECIALLY for that purpose. Send for Price List

J. B. CARR & CO., Manufacturers, TROY, NEW YORK.

## THOS. DREIN & SON, TATNALL AND RAILROAD STS., WILMINGTON, DEL.

Builders of Metallic Life Boats and Rafts, Yachts and Pleasure Boats. Life Preservers. Outfit for Lake Steamers a Specialty.



## No. 4 BECK Steam Steering Gear.

**Extracts from Letters.**

"THE steering gears of the lakes."
*Capt. Higgie, V. O. T. Co., Chicago.*

"Cannot be excelled."
*Capt. Cochran, Steamer Marion.*

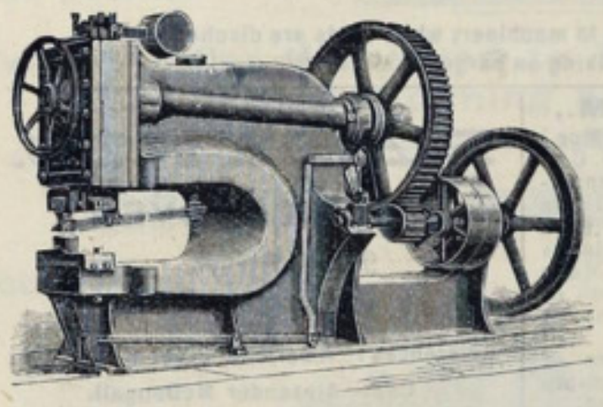
"Gives entire satisfaction."
*Independent Tug Line, Chicago.*

"Are giving excellent satisfaction."
*Milwaukee Dredge Co.*

"The No. 4 Beck Steering Gear put in our steamer, Samuel Mather, has given excellent satisfaction."
*W. L. Mahon, Mech'l Eng'r. American Steel Barge Co.*

**PAWLING & HARNISCHFEGER,**
156-168 Clinton Street,
*MILWAUKEE, WIS.*

## The Excelsior Machine and Cleveland Punch and Shear Works Co.



SUCCESSORS TO
LEIGHTON & HATHAWAY.
Manufacturers of
Punches, Shears, Bending Rolls, Rotary Planers, Overhead & Post Drill Presses.

980 to 986 Hamilton St.,
CLEVELAND, OHIO.


## MARINE REVIEW LINER EXCHANGE.

Space under this heading may be used gratis by our advertisers or subscribers to call attention to vessels or any craft, machinery, new or second hand, that they may have for sale. Those wanting machinery of any kind or wishing to purchase vessels, are invited to take advantage of the same offer. Employers in need of professional men or men who want positions may avail themselves of the opportunities offered. Each item will be limited to three lines. Letters concerning same must mention number attached to item and be addressed MARINE REVIEW, 516 Perry-Payne Building, Cleveland, O.

220—Plate straightening rolls and a combined punch and shear with 25-inch throat for sale at a bargain.

221—FOR SALE—One 5¼ by 3 by 6-inch feed pump.

222—FOR SALE—An 8 by 10-inch horizontal engine. Reply early.

223—FOR SALE—A 6 by 8-inch deck pump.

# Don't Take Their Word.

We have lots more letters from engineers you know who have changed from lard to VACUUM MARINE ENGINE OIL. A new one will follow each week. The writers will give their reasons for making the change—good ones, too, in every instance. But don't take their word for it. Try it yourself. We will give every marine engineer a chance to convince himself. If you won't at your expense, do it at ours. Drop us a line and we will tell you how.

VACUUM OIL COMPANY,
Rochester, N. Y.

Stock at all the leading ports.

**TO THOSE INTERESTED IN, OR USING VALVES.**

We have recently made improvements in the manufacture of JENKINS BROS. VALVES, having increased the number of bolts, thickness of flanges, etc.
We shall manufacture ONE GRADE OF VALVE ONLY, suitable for high or low pressure steam.
The Jenkins Discs used in these valves are suitable for HIGH OR LOW PRESSURE ☞ We guarantee all valves stamped with Trade Mark.

JENKINS BROS.,
NEW YORK. CHICAGO. BOSTON and PHILADELPHIA.

MARINE WORK A SPECIALTY. PRICES REASONABLE

**Lorain Machine and Repair Shop,**

ED. A. FULLER, PROPRIETOR,
Broadway, between Fifth and Sixth Aves., - LORAIN, O.

Shop well equipped for repairs to machinery while boats are discharging and taking on cargoes.

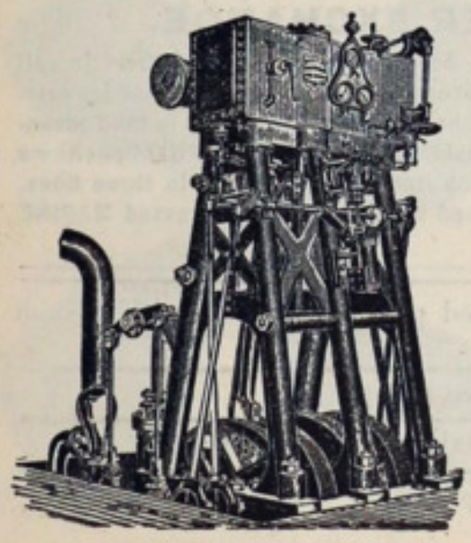
**EDWARD C. WEAVER, LL. M.,**

900 F. (op. Pat. Office.) Washington, D. C. Attorney and Counsellor in Patents, Trade Marks, Revenue Claims and all claims against the U.S. Make a clear statement of your invention or claim, and I will advise you free of charge. Send stamp for my phamphlet.

**PATENTS.**

**FRANK L. DYER,**
918 F. Street,
Washington, D. C.

References: American Steel Barge Co.; Capt. Alexander McDougall.



J. D. WILSON. M. HENDRIE

**MONTAGUE IRON WORKS,**

*MONTAGUE, MICH.*

WILSON & HENDRIE, Proprietors.

MANUFACTURERS OF

MARINE :: ENGINES :: AND :: BOILERS,

and General Mill Machinery.

**P. M. CHURCH & CO.,**

SAVINGS BANK BLOCK, SAULT STE. MARIE, MICH.

LEADING DEALERS IN

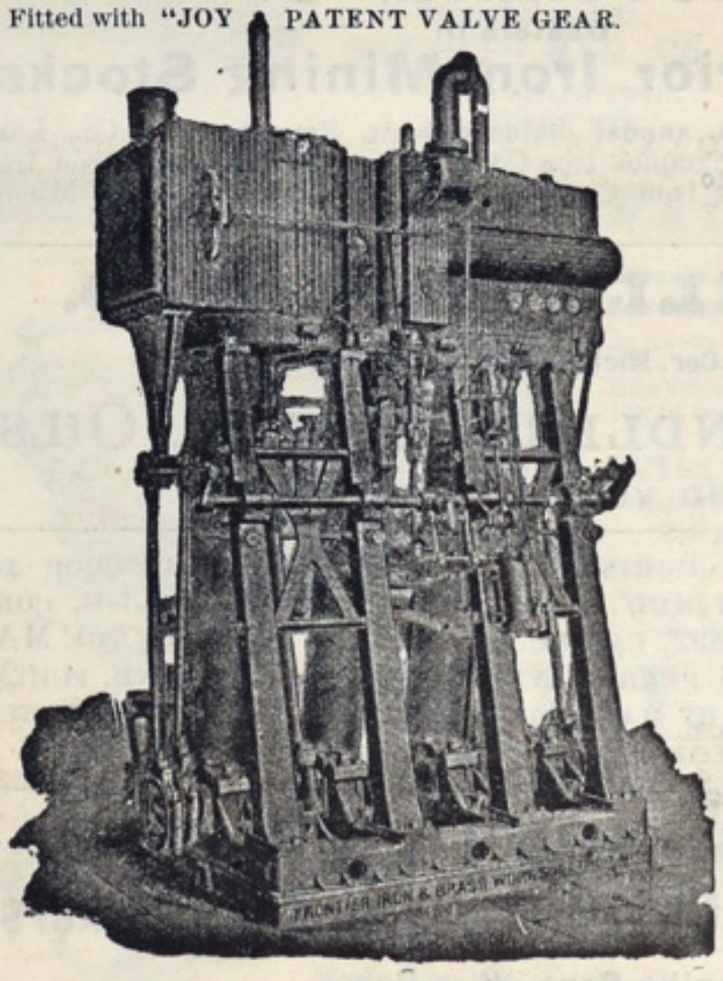
**Ship Chandlery,**

Marine Hardware, Paints, Oils, Packings, Cordage, Etc.

FIRST-CLASS COPPERSMITH AND TINSHOP IN CONNECTION.

**THE FRONTIER IRON WORKS.**

Fitted with "JOY" PATENT VALVE GEAR.



**DETROIT, MICH.,**

Builders of

**TRIPLE EXPANSION**

and all kinds of

**Marine Engines**

Engines furnished for Steamships:

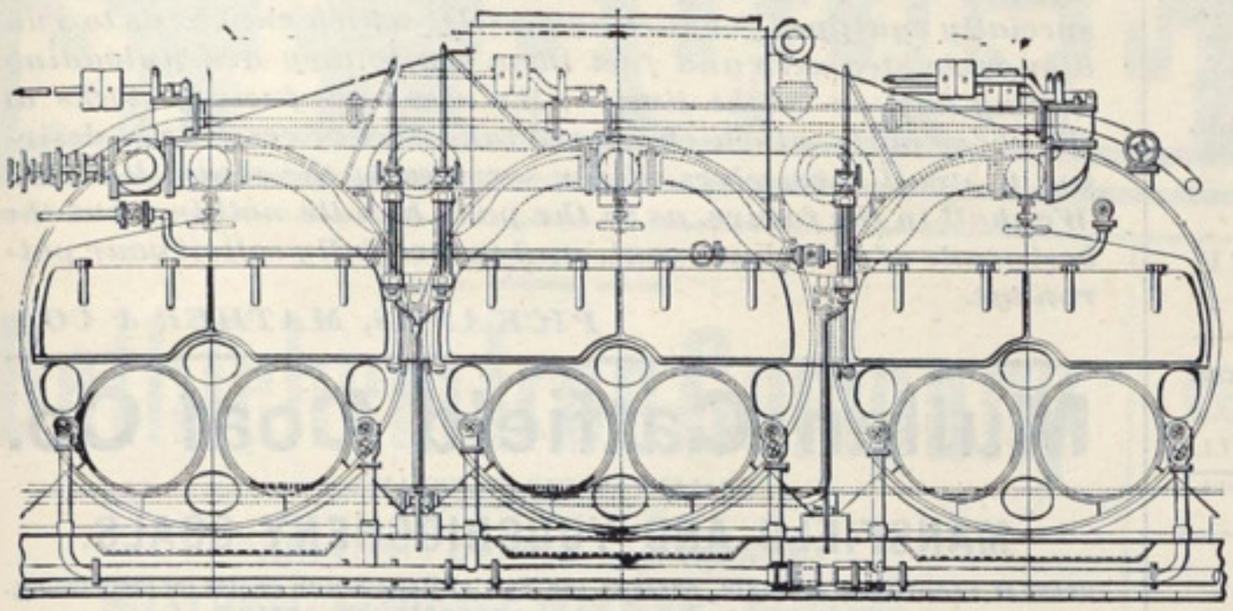
T. W. Palmer, Livingstone, Majestic, Tampa, John Mitchell, Nyanza, Fedora, Geo. F. Williams, Mackinaw, Keweenaw, Jno. Harper, W. F. Sauber and Iosco. Panther, (fore and compound). Uganda, W. H. Gilbert, C. F. Bielman.

WHALEBACKS—

Samuel Mather, Pathfinder.

CORRECTED CHARTS OF THE ST. MARY'S RIVER CAN BE HAD FROM THE MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, O.

# LAKE ERIE BOILER WORKS, BUFFALO, N. Y.



## THE BEST EQUIPPED PLANT IN AMERICA

FOR THE MANUFACTURE OF

# MODERN MARINE BOILERS.

---

OWNERS AND CAPTAINS—If you want one of these handsome calenders mailed to you, send your address on a postal card, mentioning the REVIEW, to PARKER & MILLEN, Detroit, Mich.

---

Straight Line Indicator, Price, $30.

In polished case. 3 Springs and Treatise.

**STEP FORWARD** AND OWN AN **INDICATOR** and know how to to use it. Send for circular.

HINE & ROBERTSON, 40 Cortlandt St., N. Y.

He is using the best till he has tried **EUREKA PACKING** For Steam, Water and Air. Send for Sample.

**NO MAN CAN SAFELY SAY**

---

# T. S. & J. D. NEGUS

Have the largest and finest stock of Nautical Instruments and Charts in the United States.

Estimates given for **Outfits of Steamers and Pleasure Yachts.**

**Compass Adjusters.**

Send for Catalogue and Almanac.

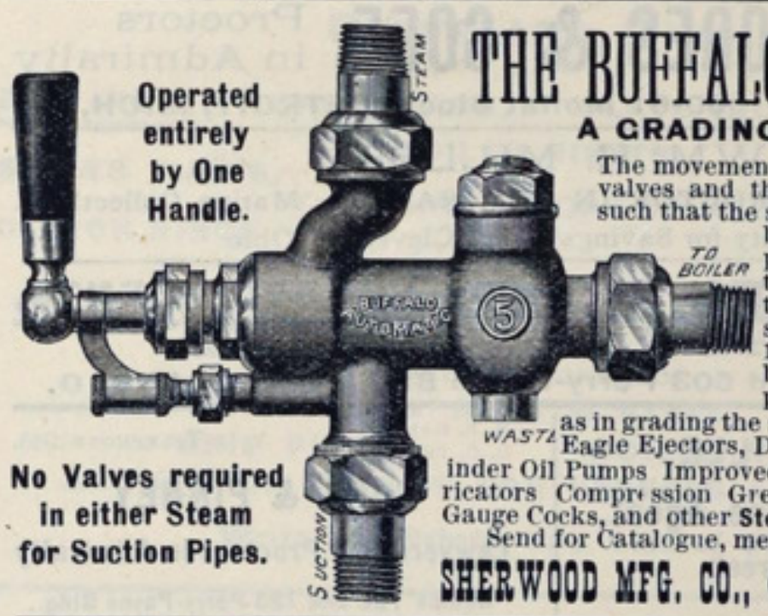
**140 Water St., New York City.**

Every attention given to Trade orders.

Try the new NEGUS LOG. Best in the World.

**Special Agents for the Celebrated Ritchie Compass.**

---




Operated entirely by One Handle.

No Valves required in either Steam for Suction Pipes.

# THE BUFFALO AUTOMATIC.

**A GRADING INJECTOR.**

The movement of the steam and water valves and their relative positions are such that the supply of water will always be in proportion to the supply of steam admitted to the jets. CAN BE GRADED to run continuously on any steam presssure from 20 to 140 lbs. Operated entirely by one handle, both in stopping and starting, as well as in grading the supply of steam and water. Eagle Ejectors, Duplex Tube Scrapers, Cylinder Oil Pumps Improved Glass Oil Cups and Lubricators Compression Grease Cups, Improved Ball Gauge Cocks, and other **Steam Users' Specialties.** Send for Catalogue, mentioning this paper.

**SHERWOOD MFG. CO., (Sole Mfrs.) BUFFALO, N. Y.**

---

## BOOKS! BOOKS!

**SEAMANSHIP.** By Capt. Sir George S. Nares, K. C. B, R. N. Sixth edition. Revised and enlarged, with four hundred and twenty colored plates and illustrations, 291 pages, 8vo., cloth, $3.00.

**THE RESISTENCE AND PROPORTIONS OF SCREW PROPELLERS.** By W. Bery. 4to cloth, $5 00.

**THE FOULING AND COROSION OF IRON SHIPS.** By Chas. F. T. Young. 8vo., cloth, $3.00.

**SPON & CHAMBERLAIN, Publishers and Booksellers, 10 Cortlandt St, N. Y.**

---

**No master trading to Lake Superior shouls be without a chart of the north shore. We have them for sale at $1 each.**

---

"The most perfect feed water heater and purifier we ever saw."—R. HAMMOND.

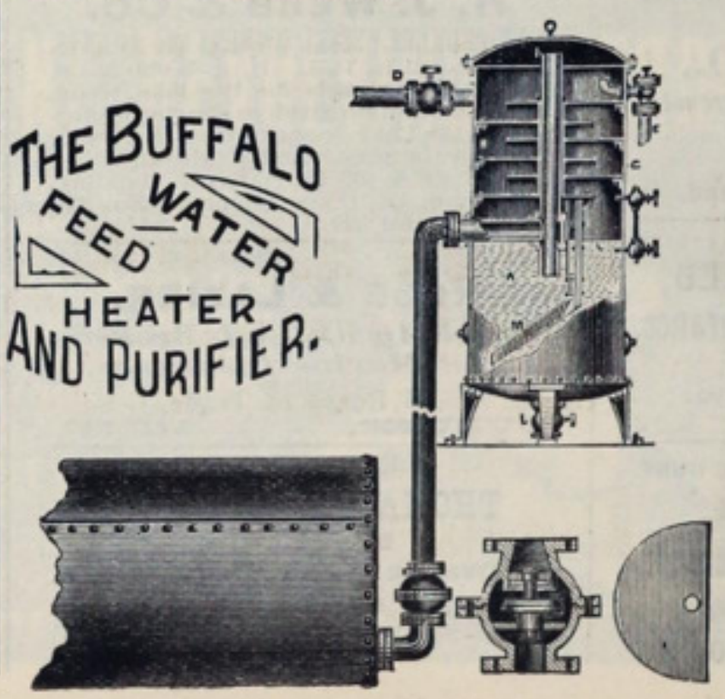
# IN PRACTICAL USE ON 25 LAKE STEAMERS.

**Every Purifier Warranted to Remove all Sediment or Scale-Forming Substance.**

## ROBERT LEARMONTH PATENTEE,

**200 BOUCK AVENUE, - - - - - BUFFALO, N. Y.**

THE BUFFALO FEED WATER HEATER AND PURIFIER.




REFERENCES.

A.—Settling chamber.
B.—Boiler.
C.—Feed pipe to boil
D.—Steam pipe.
E.—Water supply pipe.
F.—Check valve.
G.—Spray disks.
H.—Spray chamber.
I.—Equalizing tube.
J.—Blow-off pipe.
K.—Automatic shut-off valve.
L.—Division plate.
M.—Deflector and separator.

HARVEY D. GOULDER,
LAWYER AND PROCTOR IN ADMIRALTY,
CLEVELAND, O.

---

W. H. COOK.
CAPT. J. A. CALBICK.
J. B. CLOUGH.

COOK, CALBICK & CO.
Vessel Agents and Underwriters.

Tel., Main, 56. RIALTO BLDG., No. 23 Sherman St., CHICAGO, ILL.

---

H. R. SPENCER,
*ATTORNEY AT LAW and PROCTOR IN ADMIRALTY.*
218 Superior St., DULUTH, MINN.

---

C. E. KREMER, *Attorney and Counselor-at-Law and Proctor in Admiralty.*
Rooms 14, 15 and 16, Bryan Block, - - 164 LA SALLE ST., CHICAGO, ILL.

---

JOHN MITCHELL. JOHN F. WEDOW. ALFRED MITCHELL.
MITCHELL & CO.,
Vessel and Insurance Agents,
508, 509 and 510 Perry-Payne Building, CLEVELAND, OHIO.
Office Telephone, 757. Residence, John Mitchell, 3506.

---

WM. A. MOORE.
WM. V. MOORE.
JOHN H. GOFF.
MOORES & GOFF, Proctors in Admiralty
Telephone 2565. 60-61 Moffat Block, DETROIT, MICH.

---

WM. H. MILLER,
ATTORNEY AND PROCTOR IN ADMIRALTY. Marine Collections.
626 Society for Savings Bldg., Cleveland, Ohio.

---

C. R. JONES & CO., VESSEL AGENTS,
FIRE AND MARINE INSURANCE.
Nos. 501, 502 and 503 Perry-Payne Bldg., CLEVELAND, O.

---

JOHN PRINDIVILLE,
Vessel and Insurance Agent,
12 Sherman Street,
CHICAGO, ILL.
Telephone, Main, 129.

---

C. A. Macdonald. J. J. Rardon.
C. A. MACDONALD & CO.
General Insurance Agents,
RIALTO BUILDING, CHICAGO, ILL

---

H. S. LORD. J. H. NORTON.
LORD & NORTON,
*Attorneys-at-Law, Proctors and Advocates in Admiralty,*
*DULUTH, MINN.*

---

White, Johnson & McCaslin,
ATTORNEYS-AT-LAW,
—AND—
Proctors in Admiralty,
26-27 Blackstone Building,
CLEVELAND, - OHIO.

---

THOS. WILSON,
MANAGING OWNER
WILSON'S TRANSIT LINE.
Gen. Forwarder.
Freight and Vessel Agent.
CLEVELAND, O.

---

C. F. Palmer. Chas. Hutchinson.
P. J. Minch.
PALMER & CO.,
*Vessel Owners and Agents,*
(John H. Palmer and Jonn T. Hutchinson, Associates.)
Perry-Payne Bldg., Cleveland, O.

---

W. A. HAWGOOD. C. C. CANFIELD.
HAWGOOD & CANFIELD,
Vessel Agents and Marine Insurance,
604-605 Perry-Payne Bldg.,
Cleveland, - Ohio.
Telephone No. 2395.

---

Capt. LYMAN HUNT. JAMES P. HUNT.
L. HUNT & SON,
Vessel Brokerage & Marine Insurance,
Room 9, Exchange Building.
Telephone No. 522.
No. 202 Main St., BUFFALO, N.Y.

---

M. B. GARY.
O. C. PINNEY. TELEPHONE 2585.
GARY & PINNEY,
Lawyers and Proctors in Admiralty
Rooms 722 and 723 Perry-Payne Bldg.,
CLEVELAND, OHIO.

---

W. L. Windom.
ATTORNEY-AT-LAW AND PROCTOR IN ADMIRALTY
Marine Notary.
ASHLAND, WIS.

---

C. W. ELPHICKE. A. L. FITCH.
JAS. A. MYERS.
C. W. ELPHICKE & CO.,
Vessel Owners and Agents,
Marine Underwriters,
Rooms 10, 11 and 12, Wheeler Block. } 6 and 8 Sherman St. CHICAGO.
Telephone 1194.

---

E. T. HITCHCOCK,
Average Adjuster,
184 Main St.,
BUFFALO, N.Y.

---

Moore, Bartow & Gilchrist,
Ship Brokers & Agents,
Nos. 611 & 612 Perry-Payne Building,
Superior Street. Cleveland, O.

---

H. J. WEBB & CO.
SHIP BROKERS, VESSEL OWNERS and AGENTS,
Established in 1856. H. J. Webb & Co. will charter vessels for the lake trade. Special attention given to chartering vessels in the Lake Superior Iron Ore trade, both for the season and single trip.
☞No. 606 & 607 Perry-Payne Building, Cleveland, O. Office Telephone No. 338, Residence No 3228.

---

J. T. ROSE. FRANK B. LAZIER.
ROSE & LAZIER,
*Vessel Agents and Brokers, and Marine Insurance,*
16 Board of Trade,
DULUTH, - - MINN.

---

Established 1857.
THOMAS MARKS & CO.,
Merchants,
Forwarders and Shipowners,
Port Arthur, Canada.
N. B.—Special attention given to chartering vessels.

---

## To Owners and Masters of Steam Barges.

—:o:—

*We beg to call your attention to the fact that we have steam lighters at the ports of Cleveland, Ashtabula and Buffalo, specially equipped for fueling vessels, which enable us to run alongside steamers and fuel them while they are unloading during day or night time. We also have fueling docks at the above ports, at which we can take care of vessels not desiring to avail themselves of the services of the steam lighters. We shall in the future, as in the past, handle nothing but the best grade of Pittsburg coal, and respectfully solicit your patronage.*

*PICKANDS, MATHER & CO.*

---

## Mullen-Gatfield Coal Co.

— DEALERS IN THE CELEBRATED —
MANSFIELD AND YOUGHIOGHENY COALS.
Docks at SANDWICH, ONTARIO, opposite the Fort at Detroit, with chutes for rapid fueling.
Elevated docks and derrick at AMHERSTBURG, ONTARIO.

---

## THE CUDDY-MULLEN COAL CO.,

Dealers in COAL. Docks at Government Pier, Whiskey Island, and Adjoining Globe Dry Dock.
All fully equipped with Revolving Derricks; also, Lighter Carrying Derrick and One Hundred Two and One-Half Ton Buckets.
Main Office, 81 Perkins Building, East Side of Main Street Bridge.
Dock Office, 127 West River St., Cleveland, O. Telephone No. 8.
Boats Coaled Day and Night. Docks at Amherstburg,

---

## Ohio & Pennsylvania Coal Co.

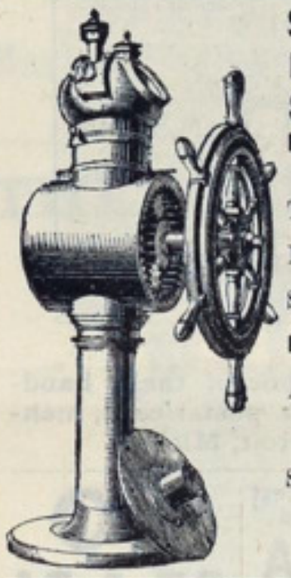
FUEL DEPARTMENT.
MINERS AND SHIPPERS,
Youghiogheny and Ohio Steam Coals. Steamboats, Tugs, etc., Coaled day or night, DOCKS FOOT WEST RIVER STREET. WHISKEY ISLAND GOVERNMENT PIER and C. & P. R. R. SLIPS. Also STEAM LIGHTER—Equipped with Revolving Derrick and (100) two ton buckets.
Telephone 1608. Office, 130 West River St., CLEVELAND, OHIO.

---

## THE HUBBARD COAL CO.

S. B. HUBBARD, Manager.
WHOLESALE COAL. JACKSON OUR SPECIALTY. STEAMERS COALED.
Office with R. B. Hubbard & Son, Wholesale Lumber,
*SANDUSKY, OHIO.*

---



SNELLING'S PATENT STEERER
For Steamers, Ships, Tugs, Yachts, Coal Barges, Etc.
The drum has powerful internal gearing.
No PURCHASE BLOCKS needed.
Simple as the common "wheel and drum."
Powerful as any Screw Steerer.
An excellent relief or auxiliary gear for vessels that steer by steam.
Send for Circular.
J. H. SNELLING,
158 South Street,
NEW YORK.

---

"Cleveland to Buffalo while you sleep."
Cleveland & Buffalo Transit Co.
Magnificent Side Wheel Steel Steamers.
"State of Ohio," and "State of New York."

DAILY TIME TABLE. (Sundays included.)

| | |
|---|---|
| L've Cleve., 7:15 P.M. | L've Buff., 7:45 P.M. |
| Ar. Buffalo, 7:30 A.M. | Ar. Cleve., 8:00 A.M. |

(Central Standard Time.)

Special Saturday Night Excursions to Niagara Falls.
☞Write for our tourist pamphlet.
H. R. ROGERS, Gen'l Pass. Agt. W. F. HERMAN, Gen'l Agt.
T. F. NEWMAN, Gen'l Mgr, Cleveland.

---

A MIGHTY MONARCH'S MENU is not surpassed by that daily offered patrons of the Nickel Plate road in its superb dining cars.

---

INQUIRIES relative to rates, time of trains, connections, etc., are always cheerfully and promptly answered by the representatives of the Nickel Plate road. Address the nearest ticket agent, or B. F. Horner, general passenger agent, Cleveland O.

---

H. A. BARR, PRESIDENT, Escanaba. F. H. VAN CLEVE, SEC. Escanaba. CAPT. GEO. BARTLEY, SUPT. Escanaba.

ESCANABA TOWING & WRECKING CO., Escanaba, Mich.
Tugs, Lighters, Steam Pumps, Hawsers, Hydraulic Jacks and Diving Appliances always ready.

| | |
|---|---|
| TUG MONARCH, | Engine Compound, Cylinder 16 and 30 inches diameter, 30 inch. Stroke, Steam Pressure Allowed, 125 pounds. |
| TUG DELTA, | Cylinder 20 by 22, Steam Pressure Allowed, 105 pounds. |
| TUG OWEN, | Cylinder 20 by 20, Steam Pressure Allowed, 104 pounds. |

CENTRIFUGAL PUMPS, Seven and Fourteen Inch Suction

---

MECHANICAL DRAWING Taught by Mail,
Also, MECHANICS, *Mining, Prospecting, Arithmetic, etc.* To begin, students only need know how to read and write. DIPLOMAS Awarded. Low Prices. Send for FREE Circular to The Correspondence School of Mechanics, Scranton, Pa

# S. F. HODGE & CO.

MARINE ENGINES,
PROPELLER WHEELS,
DECK HOISTERS,
MARINE REPAIRS.

320 ATWATER STREET,
DETROIT, MICH.

—THE—

# Bethlehem Iron Company

PRINCIPAL OFFICE and WORKS:

SOUTH BETHLEHEM, PENNA.

Steel Rails, Open Hearth, Bessemer and Nickel Steel Billets and Forgings.

Hydraulic Forged Shafting, Hollow or Solid.
Cranks, Rolls, Etc.

Rough Machined or Finished. Fluid Compressed Steel.

GUNS and ARMOR.

New York Office,
80 Broadway.

Philadelphia Office,
421 Chestnut St.

## LIFE-SAVING MATTRESSES.

THE ONLY MATTRESS made that is essential for steamship use; fitted with life-cords, each mattress becomes a LIFE PRESERVER and will hold up twenty persons in the water. They are also especially adapted for Steamships, Yachts, etc., as they are always pure and clean, never need renovating, will not absorb moisture and cannot become infected with the germs of any contagious disease. Furthermore, they make the most comfortable bed in existence. Be sure you have your new vessels fitted entire with our goods. Write for catalogue and testimonial letters.

IMPORTANT.—We have just received official notice from the U.S. Government, that ships having our AIR MATTRESSES can carry so many less Life Preservers. Manufactured and sold only by

METROPOLITAN AIR GOODS CO., 7 Temple Place, Boston, Mass.

HORACE SEE,
CONSULTING ENGINEER AND NAVAL ARCHITECT
ONE BROADWAY, NEW YORK.

## THE CONDIT FULLER CO.

CLEVELAND, OHIO.

BAR IRON, SHEET IRON, PLATE IRON, PIG IRON,
BOILER RIVETS,
BOILER TUBES, PLATE STEEL,
GAS PIPE, BOAT SPIKES,
CLINCH RINGS, STEEL NAILS.

Sales Agents of
THE CARBON STEEL CO.
Manufacturers of
OPEN HEARTH STEEL,
SHIP PLATES, BOILER PLATES,
ARCHES and STRAPS FOR VESSELS A SPECIALTY.
Write for Prices and List of Sizes.

ALSO ADAPTED FOR
Iron and Steel Heating.

For Hull and Boiler Plates, Tubes, Bending, Straightening and Laying Up Work.

## THE "WELLS LIGHT"

WALLWORK & WELLS' PATENTS.

2000 CANDLE POWER!

ESPECIALLY ADAPTED FOR

Dry Docks and Night Loading.

PORTABLE,
ENTIRELY SELF-CONTAINED,
REQUIRES NO OUTSIDE MOTIVE POWER,
UNAFFECTED BY WEATHER,
NO SPRAY, NO SMOKE, SAFE AND ECONOMICAL.
IN USE ON 15 DRY DOCKS ON THE LAKES.

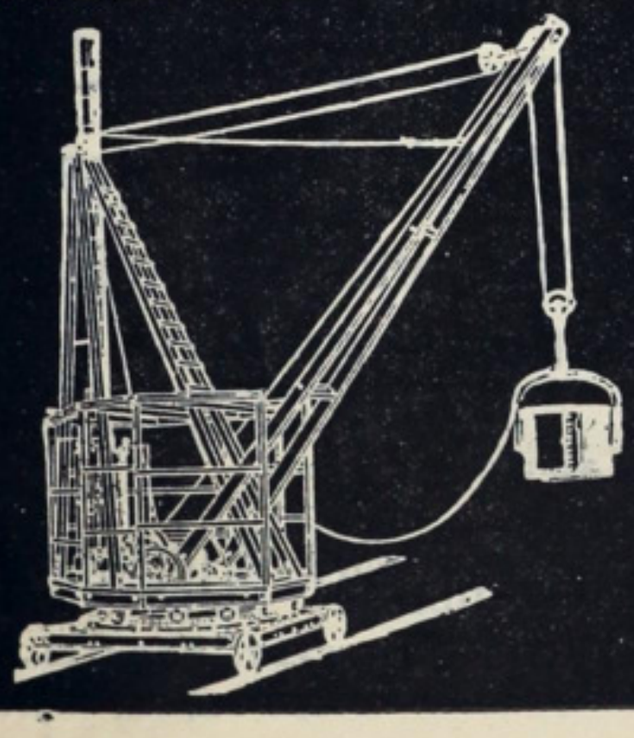
For further particulars, address

WILLIAM HALPIN,
Successor to KEEGAN & HALPIN,
45 and 46 Washington St., NEW YORK.

## McMYLER MANUFACTURING CO., 180 COLUMBUS STREET, CLEVELAND, O.

SOLE MAKERS OF THE

McMYLER PATENT REVOLVING STEAM DERRICK

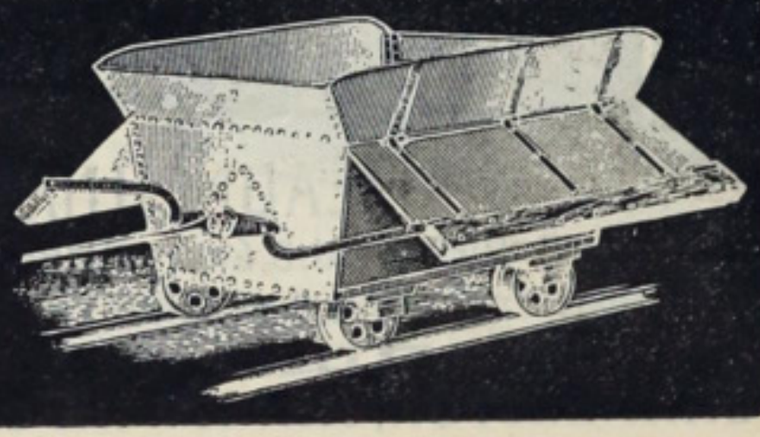


FOR HANDLING COAL, ORE AND COARSE FREIGHT OF ANY DESCRIPTION.

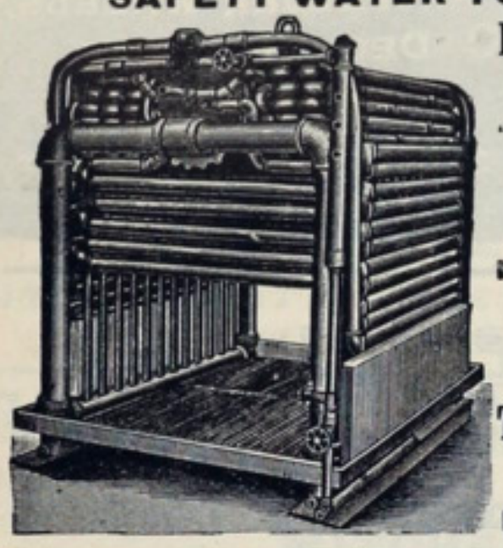
This Derrick can Lift Load, Alter the Radius of Boom, Swing in Either Direction at Will of Operator, and can Propel Itself on Track any Desired Distance.

BUILT FOR ANY CAPACITY WANTED

BUILDERS OF
CONVEYORS, COAL BUCKETS, ORE BUCKETS AND DUMP CARS.



# THE ROBERTS
## SAFETY WATER TUBE MARINE BOILER,



For Yachts, Launches and other Steamers.

THE ORIGINAL FIXED WATER LINE PIPE BOILER

"Imitation the Sincerest Flattery." We are collecting royalties from the customers of many infringers.

**OVER 500 IN USE.**

☞ SAFE, RELIABLE, SIMPLE, LIGHT WEIGHT, ECONOMICAL, NO SHOP REPAIRS, SMALL SPACE. Send for Illustrated Pamphlet and other reading matter, with hundreds of enthusiastic letters from purchasers and engineers.

**The Roberts Safety Water Tube Boiler Co.**

Works covering 12,000 sq. ft. of ground at RED BANK, N. J.

18 Cortlandt Street, NEW YORK CITY.

DAVID WHITNEY, JR., President. THE F. H. WHITNEY, Secretary

# MICHIGAN
## Fire and Marine Insurance Company,
DETROIT, MICH.

*CASH CAPITAL, - - - $ 400,000.00*
*CASH ASSETS, - - - - 840,000.00*
*LOSSES PAID, - - - - 1,800,000.00*

**THIS COMPANY DOES A GENERAL MARINE BUSINESS on the GREAT LAKES.**

**AGENTS AT ALL PRINCIPAL LAKE PORTS.**

## *The Martin-Barriss Co.*

IMPORTERS AND MANUFACTURERS OF

*Mahogany, White Mahogany,*

AND ALL NATIVE CABINET WOODS.

HIGH GRADES OF KILN DRIED WOODS FOR CABIN WORK AND INSIDE TRIM.

*White Oak Timbers and Plank*

CONSTANTLY ON HAND AND SAWED TO ORDER ON SHORT NOTICE.

*654 Seneca Street, Cleveland, Ohio.*

## ERIE RUBBER CO.
ERIE. PA.
Manufacturers of the
## KEYSTONE MARINE VALVE
*THESE*
***RED RUBBER VALVES***
*ARE THE*
**BEST AIR & FOOT VALVES MADE.**
IF YOUR DEALER DOES NOT KEEP THEM, WRITE DIRECT TO THE FACTORY.

# COAL
## STANLEY B. SMITH & CO.
OPERATING
**SMITH'S COAL DOCK,**
Detroit, Mich.
Pocket Fueling and Low Dock,
—ALSO—
LORAIN COAL DOCK,
Lorain, Ohio.
LAKE SHIPPERS OF STEAMBOAT AND STEAM COAL.
STEAMBOAT FUELING.

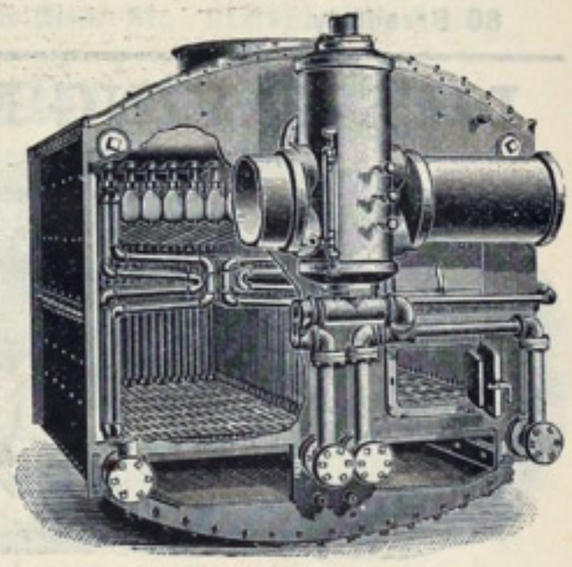
INCORPORATED 1794.
## Insurance Company of North America.

**CAPITAL, Paid up in Cash, - - $3,000,000.00**
**ASSETS, . - - - - - - - 9,744,513.70**

CHARLES PLATT, President. WILLIAM A. PLATT, Vice-President.
EUGENE L. ELLISON, 2nd Vice-President. GREVILLE E. FRYER, Sec'y. & Treas.
JOHN H. ATWOOD, Assistant Secretary.

## Lake Marine Department.
GEORGE L. McCURDY, Manager.
CHICAGO, ILLS.

**ALMY'S PATENT SECTIONAL WATER TUBE BOILER.**



The Most Efficient and Reliable Water Tube Boiler on the Market.
is neither a copy nor an infringement of any other Boiler.

MANUFACTURED BY
**The Almy Water Tube Boiler Co.**
No. 47 CLIFFORD STREET,
PROVIDENCE, R. I.

## THE BEST PAINTS FOR IRON
ARE MADE BY
# W. W. LAWRENCE & CO.
PITTSBURGH, Pa.

**RED LEAD,**
**Red Lead & Lamp Black,**
**P. R. R. Red (iron oxide),**
**METALLIC REDS,**
**METALLIC BROWNS,**
**GRAPHITE PAINT,**
**IRON FILLER,**
**STEEL COLOR PAINT,**
**CARBON BLACK.**
☞ CORRESPONDENCE SOLICITED.

## WARD BOILERS FOR STEAMERS LARGE OR SMALL
LIGHT WEIGHT, GREAT POWER
THREE TYPES,
LAUNCH, NAVY AND MARINE.
ADOPTED BY U.S. GOVERNMENT. WAR VESSELS, LAUNCHES, REVENUE CUTTERS, TUGS.
AFTER THE MOST EXHAUSTIVE COMPETITIVE TESTS. Correspondence Invited.
**CHARLES WARD,**
CHARLESTON, KANAWHA CO., W. VA.

In Use on 800 Lake Steamers.

ON THE LAKES **In Rough Weather**
You Want a
## Perfectly Automatic Injector.
THE **PENBERTHY**
Is the only one which will give you satisfaction.
SEND FOR CATALOGUE.

## PENBERTHY INJECTOR CO.
**Detroit, Mich.**
See our exhibit, Section 25, Mchy Hall, Worlds Fair.